FOURTEENTH ANNUAL REPORT

OF THE

American Dairymen's Association,

WITH

Papers, Proceedings, etc.

FOR THE YEAR ENDING

JANUARY 15, 1879.

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ARTICLES OF ASSOCIATION.

WHEREAS, It is deemed expedient to merge the New York State Cheese Manufacturers' Association, which was organized in January, 1864, into an American Association, through which, as a medium, results of the practical experience of dairymen may be gathered and disseminated to the dairying community; therefore,

Resolved, That we, the undersigned, do hereby associate ourselves together for mutual improvement in the science of cheese making, and more efficient action in promoting the general interest of the dairy community.

ARTICLE I. The name of the organization shall be THE AMERICAN DAIRYMEN'S ASSOCIATION.

ART. II. The Officers of the Association shall consist of a President, Vice Pesident, Secretary and Treasurer.

ART. III. The President, First Vice President, Secretary and Treasurer, shall constitute the Executive Board of the Association.

ART. IV. The Officers of the Association shall be elected at the regular annual meeting, and shall retain their offices until their successors are chosen.

ART. V. The regular annual meeting shall occur on the second Tuesday in January of each year, and at such place as the Executive Board shall designate.

ART. VI. The payment of one dollar shall admit any person to all the sessions of an Annual Meeting—and the additional payment of seventy-five cents shall entitle him to the Annual Report for the current year.

AMENDMENT.—The Secretary is hereby empowered to appoint an Assistant Secretary to assist during the sittings of the Convention, and discharge such other duties as may be assigned to him, and, in case of the absence or inability of the Secretary to act, to temporarily discharge the duties of that office; it being distinctly understood that no compensation is attached thereto.

[One dollar constitutes a person not attending an Annual Convention a member of the Society for one year, and entitles him to the Annual Report.]

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INTRODUCTORY.

In presenting the Fourteenth Annual Report of the American Dairymen's Association, but the first from the hand of the present Secretary, to the dairy public, he does not deem it necessary to make extended comment. The Report is quite voluminous, containing a large amount of useful information, and speaks for itself.

The Secretary has not been able to give that careful attention to proof-reading that he desired, and errors have unavoidably crept in. But he believes they are not more numerous than usual in such publications, nor of such a character as to call for an "Errata." As a general thing, the intelligent reader will make the necessary corrections.

The paper of Prof. G. C. Caldwell, on "Organized and Unorganized Ferments," presents an old subject in a new and forcible light. It will be seen that he has changed his views of ten years ago, and now holds that rennet acts, in cheesemaking, as an unorganized ferment, effecting its changes by mere contact or catalysis. The action may be electrical.

The merits of the different breeds of cattle for the dairy are earnestly and convincingly presented in "Jerseys for the Dairy," by Mr. W. L. Rutherford; "Holsteins for the Dairy," by Mr. Solomon Hoxie; "Shorthorns for the Dairy," by Hon. Harris Lewis; "Ayrshires for the Dairy," by Mr. William Crozier; and "The Universal Cow," by Mr. Frank D. Curtis. The moral is that well-selected full-bloods and grades, of any breed, are preferable to promiscuous scrubs. The intelligent dairyman will be content with nothing less than full bloods or grades, and will always use a full-blooded male.

In "Profit and Loss in Dairying," by Mr. T. D. Curtis, is presented food for reflection. It shows that money can be saved by carefully weeding out the dairy herds of the country, and that there is more money in better farming. Since reading that paper, he has come in possession of facts which more conclusively convince him that a large proportion of the dairies, all things considered, were run at a loss last season.

"The Commercial Aspects of the Dairy," by Mr. J. M. Peters, (omitted by accident from its proper place among the papers, and therefore placed after the proceedings,) and "Marketing Cheese," by Dr. L. L. Wight, give an intelligent and practical view of the subjects treated. Both papers should be carefully read by dairymen, preparatory to beginning the coming season's operations.

The food, feeding and care of stock are ably treated by Prof. Chester, in his paper on "Grasses," and Prof. Lazenby, in his paper on "Principles of Feeding." These papers are worthy of careful study by all who have the care of stock.

The salt question is ably and candidly handled by Dr. H. A. Mott, Jr.,

in "The Common Sense of the Salt Question." He gives the results of his analyses. Others might somewhat vary the list in the order of purity. But it is quite certain that the better brands are all inocuous and may be used with perfect safety in preparing dairy products. The importance of salt in the animal economy, and its value to the agriculturist as a fertilizer, are impartially and thoroughly considered by Dr. Francis E. Engelhardt, in "Salt in the Animal Economy and as a Fertilizer."

"The Purification of Butter," is an important subject briefly, but clearly and practically, handled by Col. Lewis T. Hawley. It contains hints on washing and sending butter to market that will attract the attention of butter makers. His views of the importance of protection to American industry will meet with a divided opinion—but not by any one interested in Syracuse salt blocks, so many of which are now silent and cold in decay.

On the manufacture of cheese and the requisite qualities for digestion, we have Prof. L. B. Arnold, the most practical and scientific man in the country who has written on this subject. His "Cheese and Cheesemaking" will stand among the classics of dairy literature.

The proceedings and discussions are unusually full. They bristle with points that make them interesting and instructive reading.

"Ensilage" is a glance at a subject of great interest and importance to all raisers of stock. It gives an outline of M. Goffart's system of preserving fodder green and succulent, the year round, by compression in silos or pits. Another season we shall endeavor to have this method fully explained to the Association.

T. D. CURTIS, *Secretary.*

ORGANIZED AND UNORGANIZED FERMENTS.

BY PROF. G. C. CALDWELL.

Just ten years ago, on the occasion of my first appearance before this association, I had the pleasure of delivering an address that was received with more favor than it deserved, on the subject of fermentation and putrefaction. These subjects have since that time received their full share of the study and research that have made these ten years quite as memorable as any previous decade, for scientific progress. We have, it is true, no such brilliant discoveries to record as in physics, that have given us the telephone with all its wonderful capabilities, have given us liquid oxygen and nitrogen and solid hydrogen by the condensation of gases that had hitherto successfully resisted all our efforts to change their state of aggregation, and, last of all, the promise of the utilization of a new motive force as far in advance of the steam engine as this is ahead of the average horse on our great canal. But even if no great discoveries have been made in this comparatively humble field, some small ones, nevertheless, and some new ideas may serve to provide a half hour's instruction.

Within these last ten years the line of demarcation between organized and unorganized ferments has been more plainly laid down.

Fermentation in general, inclusive of putrefaction, is now defined to be a chemical change in which an organic body, some product of vegetable or animal life, is modified in a certain way under the influence of another organic substance, which is likewise some product of vegetable or animal life and is called the ferment. The products of the chemical change produced in the first body are formed exclusively at the expense of that body; there is no union of the ferment with the fermented body or with any product of the decomposition of that body, to form a new chemical compound. One of the most striking features of this process of fermentation is the great power of the ferment, manifested in the decomposition of many hundred or thousand times its weight of the substance attacked by it.

Now we find that in certain classes of cases the ferment is not only organic, that is to say, some product of vegetable or animal life, but also organized, itself a living being, either vegetable or animal, and the fermentation is accomplished in some yet unexplained way in connection with the operation of the vital processes of the living being. The form and structure,

and in many cases the movements of these living beings are made out with the aid of the microscope, and often without the use of very high magnifying powers

One of the most familiar kinds of fermentation is that in which alcoholic liquors are made from liquids containing sugar, or from substances containing starch; the production of the alcohol is the results of the action of an organized ferment, the yeast plants, and is connected with and dependent upon the multiplication and growth of the cells of this vegetable within the fermenting liquid; but the yeast has no power to produce alcohol out of cane sugar, till after it has been converted into another kind of sugar; this conversion is not in any way connected with the growth of the yeast plant, except that it is brought about by the action of a substance supposed to be excreted by the plant; this substance is a neutral one, that is, having neither acid nor alkaline properties, is soluble in water, and contains nitrogen as well as the three other elements which go to make up the bulk of vegetable and animal matter, carbon, hydrogen and oxygen; being soluble in water, it can be filtered out from the liquid in which the yeast is growing, and with this clear filtered liquid the conversion of the unfermentable sugar into fermentable sugar can be effected without any discoverable sign of accompanying vegetable or animal growth. In like manner, the yeast plant is powerless to produce alcohol out of starch; the starch must first be converted into another and a fermentable substance, by means of a substance called diastase, which is also a neutral soluble substance, composed of carbon, hydrogen, nitrogen and oxygen, and it acts on the starch without the accompaniment of any living growth.

An eminent writer on this subject has lucidly stated the difference between the two kinds of ferments, whose action I have illustrated in the two cases just described: both ferments, he says, are derived from living organisms; the one, the unorganized ferment, or the soluble ferment as it is sometimes called, can act independently of the living organism which is necessary to produce it; but in the other case the living organism itself must be in the fermenting liquid in the actual performance of its vital processes, growing and multiplying there. We are able in the laboratory by purely chemical processes to produce certain substances artificially out of their elements, carbon, hydrogen, nitrogen and oxygen, which belong to the class of organic substances as they are usually called, and which at first had been obtained either directly or indirectly only from products of animal or vegetable life; but we have not yet been able to communicate to any such artificially prepared substance the peculiar properties and powers of these soluble ferments, any more than we have been able to produce the yeast plant without the aid of germs of previous living plants.

These soluble or unorganized ferments are left, when their solutions are dried down by evaporation, in the form of colorless solids, without any trace of crystalline or cellular structure; they are, in other words, entirely amorphous. They may also be obtained in the solid form by the addition of alcohol to their solutions in water. With regard to their chemical composition we know but little with certainty; they resemble the albuminoids, such as the albumen in the white of the egg, or the casein of milk; but they are not albuminoids, for they do not contain any sulphur, while all albuminoids do contain this element besides carbon, hydrogen, nitrogen and oxygen; as to the difference between the composition of different soluble ferments we know still less; we do not know whether they differ at all or not, or whether they owe their different characters to some other peculiarity in their structure.

The presence of salts in solutions containing these ferments sometimes hinders, and sometimes favors their action, according to the character of the ferment, the proportion of the salt in the solution, or the kind of the salt; in general, the salts of ammonia give the strongest support to the ferment, and salts of potash exert the greatest hindering power; in one instance the conversion of unfermentable into fermentable sugar was trebled by the addition of eight parts of ammonium sulphate to one hundred of the solution.

In some cases these unorganized ferments will withstand quite high temperatures without the permanent loss of their fermenting power, as compared with the organized ferments; pepsin, one of these ferments, has been heated to 230° Fahr. without destroying any of its fermenting power; the ferment found in the pancreatic juice which brings about certain changes in the albuminoids and fats of the food that it meets in the intestines has been heated to 320° without the entire destruction of its power, and to 225° for half an hour, and to 208° for five hours without the loss of any power.

In some cases we find several of these ferments in one and the same liquid: as in the pancreatic juice of the animal, where there is one ferment that alters the albuminoids, another that breaks up the fats, and still a third that converts the starch into sugar; and these ferments may be in a measure separated from one another, by treating the pancreatic glands with solutions of different salts, one salt serving to extract one ferment only, and leaving the others; a solution of rochelle salt, or of nitrate of ammonia will extract nothing but the ferment that acts on the albuminoids, while the one that converts the fats is taken up by bicarbonate of soda.

There are other points of difference between unorganized and organized ferments, some of which furnish us with quick and ready means of determining whether in any given case we have

to deal with the one kind or the other; a brief consideration of these reactions will serve to bring out in a still more striking manner the strong line of demarcation between the two kinds of ferments. When an unorganized ferment is exposed to the action of oxygen gas under pressure it is killed: an unorganized ferment is not. Certain chemicals which stop alcoholic fermentation, or any other kind of fermentation of a similar character, have no effect at all on the action of diastase; these are prussic acid, alcohol, ether, chloroform, and oil of turpentine; on the other hand, citric and tartaric acids, which hinder alcoholic fermentation but slightly, stop the action of diastase completely; borax stops the action of the soluble but not of the organized ferments. Acids in general hinder the action of the soluble ferments; carbolic acid, which is however not a true acid, has but little effect upon them; no organized ferment will work in a solution containing more than 0.5 per cent of carbolic acid, while a soluble ferment like pepsin continues its action without hindrance.

Another and an important point of difference between the two kinds of ferments is found in the different kind of chemical changes which they produce; the change produced by the organized ferment is much more complicated than that produced by the unorganized. When yeast acts on sugar, alcohol is not the only product; carbonic acid is also produced, and besides these, the main products, a little glycerine and succinnic acid appear; the work, like much of what is done by organized beings, is so complicated that we cannot imitate it in the laboratory; we can produce all these substances simultaneously from sugar only by bringing the yeast plant to our aid, and causing it to grow in the solution. The chemical change produced by the soluble ferment, on the other hand, is more simple in its character, and can be precisely imitated in the laboratory by purely chemical means, and without the coöperation of the ferment; the conversion of the starch into sugar can be effected in many ways—by the action of acids or alkalies aided by heat, or by water and heat, or even by heat alone. So, likewise, we can convert unfermentable into fermentable sugar, without the aid of the ferment excreted by the yeast plant; we can saponify the fats by means of certain chemical agents precisely as they are changed by the ferment in the pancreatic juice. When we come to see what the character is of this chemical change that is produced by the soluble ferments, we find that it consists in some cases simply in affixing water to the fermented body—a chemical change quite similar to that which takes place when water is poured over quicklime to slake it, a new compound of the lime and the water being formed, the hydrate of lime. In other cases, besides this hydratation there may be a splitting up of the fermented body into two or

more new substances; the neatest illustration of this is found in the saponification of the fats already referred to; the fat takes up water, under the influence of the saponifying agent, and then breaks up into the well-known substance glycerine, and one or more fatty acids such as stearic or oleic acids; the whole process of making soap is based on this reaction, and this mode of decomposing the fat; the fatty acid unites chemically with the potash or soda to form the soap, while the glycerine is an important article of commerce by itself.

Now, before taking up the question which has perhaps already arisen in your own minds, and towards which it has perhaps occured to you that I am tending, whether the ferment in rennet is an organized or an unorganized ferment, let me say a word or two about a few of the best known unorganized ferments, that you may see how much they have to do in the economy of nature, and how much we ourselves owe to them, although their work appears to be so simple and easy.

First, there are the diastases, ferments found in different organisms but producing the same effect of converting starch into sugar. One of these ferments appears especially in germinating seeds of our grains, and in converting the insoluble starch into soluble sugar helps the young plantlet to get its nutriment from the seed: it can convert two thousand times its weight of starch into sugar. But we find it not only in the seed, but also in other parts of the plant — in the young wood of some trees, where, when vegetation awakens in the spring, it may likewise serve to convert starch into sugar; it is found in the leaves, roots and flowers, in a great number of cases, and in potatoes and onions; and wherever it occurs there is the same work for it to do. Besides this form of diastase, there is another ferment called maltin, capable of doing the same work, and found in all germinating seeds of the cereals, which is said to be so powerful as to convert from 100,000 to 200,000 times its weight of starch into some soluble substance, and 10,000 times its weight of starch into sugar. Now let me call your special attention to the fact that in the animal we meet with a similar ferment; it is found in the saliva, and in another and more powerful form in the pancreatic juice, which will convert the starch into sugar almost instantly; in the liver is another of these ferments. But the most interesting instance of its occurrence is in the caterpillar or larva of the common house fly, which is said to be a veritable bag-full of a substance resembling starch; when the larva passes into the chrysalis state and the perfect insect is to be formed the ferment appears with the power to convert this starch-like substance into sugar for the use of the infant which is finally to come forth as the ever-vexatious fly. But while these diastases in the animal have the same power to convert starch into sugar that they possess in the plant, yet

that they are not precisely the same substances is shown by the interesting fact that they do not all work most efficiently at the same temperature; while the diastase in geminating grain does its best work at about 160° Fahr., the diastase in the animal works most rapidly at about 98° and its activity is almost destroyed at the higher temperatue which is most favorable for the ferment of vegetable origin.

The ferment that appears to be exereted by the yeast plant to convert the unfermentable sugar into fermentable is found in plants of higher orders and also in animals; cane sugar cannot be assimilated till it has been digested, and this digestion consists in its conversion into fermentable sugar; the ferment is found also in the juice of the intestines.

I have already mentioned the ferment in the pancreatic juice that saponifies the fats; a similar ferment is said to be found in those seeds in which oil instead of starch is stored up for the nourishment of the young plantlet; therefore we find this ferment also in both the animal and the vegetable kingdom.

The most important of these ferments in the animal economy is the so-called pepsin of the stomach, which does a part of the work of digesting the albuminoids taken in as food; and another much more powerful ferment of a similar character appears in the pancreatic juice, and completes the work only partly done by the pepsin. The new bodies, the so-called peptones, differ but slightly in composition from the albuminoids out of which they were produced, and the chemical change is believed to consist, as in the case of the action of these unorganized ferments generally, only in a fixation of water on the albuminoids; but the new bodies differ in some important respects from the true albuminoids; they pass more easily through the tissues, and are not coagulated by heat. Now the analogy that we have followed so far between the plant and the animal does not fail us with respect to this ferment, for we find the albuminoids altered in a similar way in the plant; beginning with the lower orders we find the peptones or these altered albuminoids in the yeast plant; passing up higher, we find a ferment possessing the power of bringing about this change in the albuminoids in the cotyledons or the thick seed-leaves of the bean, where it can manifestly serve the useful purpose of converting the albuminous matter, of the seed into forms better fitted for the nourishment of the young plant. And in the case of those curious plants that have lately been proved to feed to some extent on insects caught by their leaves, which organs are peculiarly contrived to serve as fly traps, ferments have been found almost precisely like pepsin or the soluble ferment of the stomach.

To which of these two classes of ferments does the ferment in rennet belong, that coagulates the milk? Is it an organized or an unorganized ferment? Does it multiply and grow in the

milk, as the yeast plant does in the solution of sugar, and in connection with that growth coagulate the milk, or is it simply a soluble ferment produced by a living organism but capable of acting apart from that organism, and without any manifestation of multiplication and growth?

In the paper which I read before this association ten years ago, I took the ground, on the basis of the researches of Hallier, a German microscopist, that this was an organized; in fact at that time but little was said about any other kind of ferment. Hallier claimed, as you may remember, that he had seen the ferment increase and multiply under the object glass of his powerful microscope, in connection with the coagulation of milk, and he gave to the organism the name micrococcus. Other considerations, taken together with the results of these investigations, appeared to leave but little room for doubt, and we were certainly able to present a pretty strong case in favor of the organized character of this ferment. But we must live and learn, and I am now constrained to take the other view, that the ferment is unorganized, even though, as I read Hallier's paper over again, I am almost confirmed anew in his opinion. But no person claiming to be a skillful microscopist, and only such a one can be trusted to draw safe conclusions from observations made with the high powers used by this scientist, has gone over the same ground and confirmed his results; on the contrary, some good microscopists have questioned their trustworthiness.

Some light may be thrown on the disputed question by applying to the ferment some of those chemical tests which have already been mentioned as serving to distinguish organized from unorganized ferments. At my request, Miss Josephine Chevalier of my laboratory has made some of these tests, and the results obtained show that the rennet ferment behaves like other unorganized ferments in these respects. An extract of rennet was taken for the purpose which would coagulate 2,500 parts of milk in about eleven minutes at the usual temperature; to a portion of this its volume of chloroform was added, the mixture was thoroughly shaken together, and allowed to stand a few minutes; the rennet in this mixture then coagulated a thousand parts of milk in five minutes; in two other experiments smaller proportions of chloroform were taken with similar results; this reagent, then, which kills organized ferments very speedily, did not in the least weaken the strength of the rennet ferment. In another experiment equal parts of a solution of corrosive sublimate and rennet extract were thoroughly mixed together; one part of the rennet in this mixture coagulated 1,000 parts of milk in four minutes; therefore the strength of the rennet was not weakened by this agent, the use of which for the prevention of the attacks of organized ferments on wood

is familar to us in the process of kyanizing. In another series of experiments in which ether was used in the place of chloroform the result was the same—no visible reduction of the power of the rennet. In another experiment equal parts of a strong solution of citric acid and rennet were mixed together, and after a few minutes the test was made, and it was found that although the power of the ferment was not entirely destroyed, one part of it required an hour to coagulate 1,000 of milk; in the early part of the paper it was stated that citric and tartaric acids do not affect the action of the organized ferments but do stop that of the unorganized ferments.

In the mode of preparation of a pure rennet ferment we find another confirmation of the view now taken as to its character, it being the same series of operations that is made use of in the general preparation or rather isolation of the unorganized ferments. The substance is dried, treated with alcohol, dried again and pulverized as much as possible, and the ferment is dissolved out of this powder by glycerine; the solution is strained through filter paper which would allow no solid particle to pass through, such as the organized ferments are; the ferment is precipitated from this solution by alcohol, redisolved in glycerine and re-precipitated by alcohol; these two operations may be repeated again and again to secure greater purity of the product, especially with reference to the albuminous matter with which it is largely mixed at first. In such a way as this tolerable diastase, or pepsin may be prepared, as well as the rennet ferment. But in no such way as this could we prepare a pure organized ferment; only an infinitely small quantity of alcohol could be produced with the aid of yeast that should be subjected to such treatment as this; the very first step with alcohol would be fatal.

Again, it is easy to propagate either fermentation or putrefaction to an unlimited extent, simply by bringing a fresh quanty of a fermentable or a putrescible substance in contact with a small portion of a substance already engaged in one or the other of these processes of decomposition; that this is not practicable in the case of the coagulation of milk in the manufacture of cheese every dairyman knows; if it were practicable in the same sense that yeast can be propagated from one portion of dough to another, the use of fresh rennets might long ago have been given up, and the extracts of rennet now so much liked could be made without rennets. It is true that in some cases there has been the apparent production of fresh coagulating liquid from old cheese; but the coagulation may have been effected by remains of the original quantity of ferment, which continued its existence in the cheese; we can see no reason why it should not have remained there. If from a small quantity of the cheese made from this coagulation in the second degree

a third quantity could have been made, and so on without end, it would be quite another matter; but I do not know that this has been done. This explanation of the possibility of coagulating a fresh quantity of milk by a piece of old cheese does not appear to me to be unreasonable, in view of the extraordinary power of these unorganized ferments in some cases; experiments seem to show that their power is wonderfully great, though doubtless not unlimited; but no measurements of this power are accurate; it is measured with great difficulty because it is so difficult to prepare the ferments quite pure. I have already spoken of the great power of a diastase named maltin which will convert from 100,000 to 200,000 times its weight of starch into soluble matter. Soxhlet states that he has prepared a small quantity of a solution of rennet that would coagulate 50,000 times its weight of milk; the coagulating power of the solution resided, of course, in the organic substance contained in it; one cubic centimeter of the liquid contained 0.081 grain of this organic substance; 50,000 cubic centimeters of the milk would weigh about 51,500 grams, which divided by 0.081 shows that one part of the organic substance containing the ferment coagulated at least 630,000 parts of milk; but as this organic substance was not pure ferment, the power of the pure ferment must be rated still higher, and perhaps we may yet find it to be represented by a million. Such power as this put forth in such a short time is not possessed by an organized ferment; that is to say, a given quantity of a ferment cannot within the space of a few brief minutes cause the fermentation of many hundred thousand times its weight of another substance; such an amount of work may be accomplished in time, of course, by the increase of the ferment itself, each new portion that is produced becoming the parent of another portion that can serve to ferment another quantity of the fermentable substance and to generate more ferment, and so on; so one man may become the progenitor of a whole nation of people, if you will give him time enough. My own faith in Hallier's views received its first shock, when, as I watched the operation of curdling the milk in a large cheese vat, I came to a realizing sense of the wonderful power of the ferment; it appeared to me then well-nigh impossible that any kind of microscopic growth could spread itself throughout that mass of milk at such a tremendous rate as would be necessary in order to account for the effect produced.

Some organism specially concerned in the process of putrefaction, the fact of whose growth and multiplication in a putrefying liquid is generally allowed by microscopists, are called bacteria; these may be the same as Hallier's micrococcus. Some recent experiments by Mayer have shown that bacteria alone cannot coagulate the milk, but that they, nevertheless,

do appear to assist the rennet; he compared the fermenting power of a solution of rennet ferment containing also bacteria with a solution free from these organisms, and fouud that, other things being equal, from two to three parts of the former would do the same work as four of the latter; but if the liquid containing both was heated up to 160° Fahr., so as to destroy the rennet ferment, and afterwards allowed to stand in a warm place till liberally stocked again with bacteria, it then produced no effect whatever on the milk, other than its normal effect of inducing putrefaction. This result gives a negative answer to the question that had occurred to me and may possibly have suggested itself to you, whether the rennet ferment might not be a substance excreted by the regular putrefactive organisms, just as the yeast plant is said to execrate a substance that converts unfermentable into fermentable sugar; if this were possible, there might be some explanation of Hallier's results that seemed so plainly to indicate some direct connection between these organisms and the process of coagulation.

Finally, we have one more support for the view that the ren ret ferment is unorganized, in that as in the case of unorganized ferments generally, the effect it produces can be produced by simple chemical means, such as the action of acids, whose coagulating power is well known.

It appears to me, from what has gone before, that we must for the present regard it as a settle fact that we must fall back upon living organisms of the higher orders for the rennet ferment, which organisms yield it as one of the peculiar products of their own vital forces, and that we cannot obtain it by the cultivation of any form of fungus. But that we must depend on animal organisms is not so sure; it was not without a special object in view that I called your attention in an earlier part of this paper to the occurrence of similar unorganized ferments in both the vegetable and the animal kingdoms. This comparison holds good also with regard to the rennet ferment. It is well known that in some countries an extract of artichoke flowers is used in cheese making, although the coagulum is not so firm as that obtained with rennet; the stringy coagulation of milk said to be obtained by the Laplanders by means of the juice of the butterwort (pinguiculum vulgaris) was alluded to in my first paper on putrefaction and fermentation. Finally in one of the journals of this year the report is given of some investigations showing the occurrence of a very strong pepsin ferment, that also coagulates milk, in the milky juice of the pawpaw or melon tree (Carica papaya), and it is suggested that this juice may possibly be used as a substitute for rennet in the manufacture of cheese. This tree has long had a remarkable reputation; its fruit is said to contain a substance resembling the fibrin of of the blood, and tough meat left hanging to the tree for a time is said to become more tender.

Therefore while nothing has as yet been found that can serve as a practicable substitute for the rennet from the stomach in the manufacture of cheese of a young animal, one would hardly venture to assert in the face of the facts here presented that such a discovery may not yet be made, and that we shall not be able at some future and perhaps not very distant day to press into our service some vegetable substance, that will be both cleaner and cheaper than what we are now obliged to use.

JERSEYS FOR THE DAIRY.

BY W. L. RUTHERFORD.

It is generally conceded that the Channel Island cattle are the best of all known breeds for the production of butter, both as regards quantity and quality. This includes the Jersey and Guernsey breeds. The Guernsey cow is somewhat larger and coarser than the Jersey, and does not possess the full placid eye and thoroughbred appearance so characteristic of the Jersey cow. Compared with the Jersey, she is said to yield a larger quantity of milk, producing a higher colored butter, but not of so firm a texture. She possesses many of the characteristics of the Jerseys, and is not considered a foreign breed by Jerseymen. The breeds have not been crossed to any extent, each Island considering its own breed the best. She may become a formidable rival of the Jersey, though it is said that some of the earlier importations of Roswell L. Colt were Guernseys and were discarded in favor of the Jerseys.

The Jerseys have proved to be well adapted to various climates and conditions, and have become general favorites wherever they have been introduced. It is a rare occurrence to find a man who has given them a fair trial that is not enthusiastic in their praise.

The earliest record that I have been able to find of the milk yield of a Jersey cow is the mention in 1771, of a cow called "Alderney," owned by a Mr. Lewis, and spoken of as having given four gallons of milk daily—equal to about 35 lbs.—which would be considered a very good yield now.

In 1789—ninety years ago—the local legislature passed a stringent law prohibiting the importation of any foreign bred cattle, believing then, as they do now, that no other breed can improve the Jersey. This law is still in force. Of their early breeding and management we learn from a communication by Col. Le Couteur to the Royal Agricultural Society, of England, that, "in the selection of breeding animals, the only question asked by the judicious farmer was, 'is the breed a good one?' meaning solely had its progenitors been renowned for their milking and creaming qualities;" and no doubt this was the principal point which established the most useful and needful quality of the Jersey cow. The care of the cows devolved entirely upon the female members of the family, and the farms being small, only a few cows were kept and the milking and creaming qualities of each cow were likely to be known—especially as on the produce

of the cows the farmer mainly depended for money to pay his rents. The original color of the Jersey was principally a pale yellow fawn, with patches of white, white legs, belly, flank and switch. In form they were ewe-necked, flat-sided, sickle-hammed, wide between the ribs and hips, and saddle-backed, but always possessing a deer-like head, and her eye the quickness and brilliancy of the gazelle; crumpled, waxy horns, fine limbs, and above all a capacious and well-formed udder, with large milk veins and teats rather long than large. She is remarkable for her docility, and is a dear lover of home, owing to the custom of tethering on the Island—the cows never being allowed to run at large. Among the early writers, I only find one who says, "the Jersey cow is a voracious eater," and this acords with my experience. The Jersey is a heartier feeder than either the native or the Ayrshire, is less particular about the quality of her food, and responds promptly at the pail to a generous diet.

No improvement in the form of the Jersey was attempted until about the year 1834, when a few gentlemen, presided over by Lieut.-Governor Thornton, adopted a scale of points to meet the English demand, which called for a more symmetrical form than was possessed by the then ungainly Jersey. Since then, the improvement in her general appearance has been very marked. Previous to this, however, the little Jerseys had become great favorites with the English gentlemen, who prized them for the rich cream which their milk afforded, as well as for ornaments for their parks. As an evidence of the esteem in which these cattle were held by gentlemen in England, I copy from a letter written by Col. J. Le Couteur to the Secretary of the "American Jersey Cattle Club:"

"The late Earl Spencer, a worthy cotemporary of Booth and Bates, had a fine little herd of Jersey cows. When on a visit to him at Alsop, in 1839, he strongly advised me to recommend our farmers never to venture on a foreign cross—merely to cross the cows of the low rich pastures with the hardy bulls of the exposed northern coast, and *vice versa*.

"We had established a character in our cows for creaming and milking habits peculiar to our crumpled-horned race, to hold to that alone, by which means our breed might continue as renowned in the next century as it has been in the present one."

Although the Jerseys were introduced into England before they were into this country, they have not, I think, become as general favorites with dairymen, as in this country—perhaps partly owing to the fact that they have been bred more for style and color than for utility, and have been looked upon as a gentleman's cow. The early importations of Jerseys into this country are difficult to trace. I think the late J. P. Swain, of

Bronxville, N. Y., once told me that he owned the first Jersey or Alderney cow that was brought to this country. He bought her from a ship captain who had brought her over for the use of the vessel. She was such a funny looking little creature that he paid the extravagant price of sixty dollars for her. I think, however, this could not have been earlier than 1834 or 1835; and reference is made in memoirs of the "Philadelphia Society for the Promotion of Agriculture," to three Alderney cows (as they were then called) imported by Maurice and William Wurts, in 1815. One of them is noticed as having "given 14 quarts of milk per day, of superior richness," and as having produced 9½ lbs. of butter per week, at three years old. In 1840, three Jersey or Guernsey cows were brought to New York in the schooner Pilot, Capt. Belcir, and purchased by Nicholas Biddle. These, with the early importations of J. A. Taintor, Thos. Motley, and others, "were not inferior in their creaming qualities to the best of later importations." The butter record of Motley's Flora was 511 lbs. in one year. It is to be regretted that so few yearly records of our best cows are kept. We have authentic records of 14 lbs. to 16 lbs. per week, and of over 50 lbs. in a month; but as a cow must be fed the whole year, it is of the greatest importance to dairymen to know how much of the year she is paying a profit, and how much, if any, the yearly profit is.

E. W. Stewart, in a late number of the *Country Gentleman*, says truly: "The value of a cow depends very much on how long she holds out in milk—even more upon this than upon a large yield at the flush." This is a prominent characteristic of the Jersey cow, as thoroughly established as the breed itself. Many farmers on the Island keep only one or two cows—few keep more than five or six; and, depending much on their cows for food and profit, they wanted one to give milk as many days as possible, and wisely encouraged this tendency, until it became a hereditary trait, as also that of uniformity of quantity.

A large flow of milk at the flush is not sought for in the Jersey. I consider a large yield of milk a serious drawback in the value of a cow for the butter dairy; and it is said that it is so regarded by many of the best breeders on the Island.

I have never yet, in my own personal experience, found a cow yielding a large quantity of milk that was rich in cream. Even the same individual cow, when giving her largest yield, is giving her poorest quality—as, for instance, a Jersey cow in the flush, milking 28 lbs. to 30 lbs. per day, it may require 18 lbs. or 19 lbs. of milk to produce a pound of butter; when the same cow is milking only 12 lbs. or 14 lbs. per day, a pound of butter may be made from 14 lbs. of milk. The milk of Jersey cow Victoria 3175, whose quantity record in June was

nearly 18 lbs. of milk to one of butter, was tested the following February by a neighbor farmer, when from six quarts of milk —being the yield of one day—he made one pound and two ounces of butter. We had in our herd, this season, two heifers. Judging from their breeding, I predicted that one would yield a less quantity of milk and yet produce more butter than the other. The result was that one gave 28 lbs. of milk per day, at the flush, producing 20½ ounces of butter; the other gave 22 lbs. of milk, producing 19¾ ounces of butter. The heifers were two years old, and there were ten days between their time of coming into milk. It required 4 lbs. more milk to produce a pound of butter from the heifer which gave the largest quantity. In the hands of some breeders in this country, the milk yield of Jersey cows has been increased; and within a certain limit it may be desirable to increase the flow of milk—that is, to an extent that will not deteriorate the quality; for it is possible that the vital force expended in the secretion of a large amount of fluid may carry off fat that otherwise would be deposited in the cream. There is no doubt that physical exertion has this effect, and that the delicacy of limb and slight development of muscle in the Jersey is the natural result of the want of exercise; and the unusual proportion of fat in Jersey milk is owing to the slight waste of the fat forming portion of the food by physical exertion. We can account for the difference in the quality of milk in the different breeds on no other theory. The practice of tethering and hand-feeding the Jersey cow traces as far back as the cow herself, and in this way the tendency to produce milk rich in fat has been encouraged for generations, perhaps for many centuries.

It is an established fact, by which we may profit, that the more quiet and contented a cow is by nature, and the less exertion she is required to make in quest of food, the greater will be her yield of milk, and still greater will be the effect on its quality. The fat is wasted or thrown off by perspiration and respiration, and when excited to an unusual degree, the waste is very rapid.

My attention was called to this fact many years ago, when I sent a choice cow three miles to be served. The farmer milked her and set the milk by itself and condemned the quality, when in fact the fatty portion had been consumed by fever and physical exertion. Another farmer tested her milk under favorable conditions and pronounced it superior to the milk of any of his herd. I have since become satisfied from experiments that the quality is affected even more than the quantity by any and every exertion of the cow, and the breeder who will improve his dairy stock, or reap the greatest profit from his dairy, will adopt a system of small pastures and supplement them by soiling.

Though less fully developed in lungs and muscle, and more delicate in appearance than most other breeds, experience proves the Jersey equal to any hardship to which a dairy cow should be subjected. She is really possessed of a strong constitution, retaining her usefulness to a good age. We have in our herd an imported cow thirteen years old, which breeds regularly, and has made the best milk and butter record the past year that she has ever done, and seems as vigorous to-day as she did three or four years ago—when Prof. Arnold pronounced her the best model of a Jersey cow he had ever seen.

As a milk producer, the Jersey cow is by no means inferior in proportion to her live weight.

H. B. Osgood, of Whitinsville, Mass., writing to me several years ago, said that he had sold milk for twenty years, formerly from Natives, and Ayrshire and Shorthorn grades, and for the last ten years from Jerseys, and that his books showed that he sold more milk in a year from his Jerseys than from the others.

Dr. Sturtevant, one of our most intelligent and successful breeders of Ayrshires, in the *Scientific Farmer* for December, pays a high compliment to the Jerseys as milkers. Speaking of the Jerseys on "Durfoot Farm," he says: "In the barn another band of seekers were admiring the sleek cows of the Jersey breed, which furnish the milk in a quantity and of a quality rarely to be found elsewhere, and whose appearance did not belie the milk record for the week, which was posted up in its appropriate place, near by. We think the general impression was a just one that these cows before us were indeed large milkers," &c.

I had the pleasure of a visit to "Durfoot Farm," last June, and can bear testimony that Mr. Burnett, the proprietor, is one of the few breeders in this country who is improving the milking qualities, as well as the general appearance, of Jersey cattle.

The milk record of our herd of registered Jerseys for the year 1876 was an average of 4,640 lbs. per cow, including heifers; in 1877 it was 4,282 lbs.; in 1878, 4,814 lbs.

The milk and butter record of Nelly, whose record for the year 1876 I gave in part in a paper read before the New York State Dairymen's Association, was: In 1876—5,825 lbs. of milk, 398 lbs. of butter; in 1877—6,040 lbs. of milk, 391 lbs. of butter; in 1878, it was 6,835 lbs. of milk, 426½ lbs. of butter.

Nelly is thirteen years old, dropped a calf January 26, 1876; another, February 7, 1877; another, February 22, 1878; and another on the 9th of January, 1879. Her live weight is 925 lbs.

I have no doubt there are other Jersey herds that can show a better milk record than this, as we do not breed for quantity

of milk, nor for the color of the hair or tongue, but for the best results in cream and butter.

It is the very general opinion that Jersey cows are unprofitable for the cheese dairy, which opinion seems to be founded upon the theory that the large globules in the milk are lost in the manufacture of cheese, and that the amount of cheese produced from a given quantity of milk depends mainly upon the amount of casein contained in the milk; but if the fatty portion of milk can be held in the curd, it is clear that the quantity of cheese depends equally upon both properties, and the quality upon the fat. I am not posted in the science of cheese making, else I should have tested the economy of making cheese from Jersey milk ere now; but from tests which have been made, we conclude that the fat can be held in the curd, and that in both quantity and quality cheese made from the milk of Jersey cows is superior to that made from the milk of other breeds.

Mr. J. Le Feuvre, of La Hague, Island of Jersey, tried the experiment, about ten years ago, and succeeded to admiration.

J. K. Nelson, of Winthrop, Maine, has made cheese for several years from the milk of Grade Jerseys, getting a pound of cheese from something over eight pounds of milk; and if I am correctly informed, he made a pound from less than eight pounds of pure Jersey milk, and all of a very superior quality.

Two of these cheeses were sent to Prof. Caldwell, of Cornell University, and Prof. Arnold, to be analyzed, and proved to have about forty per cent. of fat and twenty-two per cent. of casein.

I quote from Prof. Arnold—certainly good authority. He says: "I have made one determination of the fat it contains and found 40.2 per cent. of pure fat. The cheese is certainly very fine. I met with nothing better from any quarter. It is as rich as Stilton, salvy and soluble, melting in the mouth, and has a fine nutty flavor, with plenty of body.

In order to form an estimate of the amount of cheese that a dairy of Jerseys would produce, I will take the average yield of milk from our own dairy, for the last three years.

In 1876, the average yield was 4,640 lbs. per cow (including heifers); in 1877, it was 4,282 lbs. per cow; and in 1878, it was 4,814 lbs. per cow. The average yield per cow is 4,580 lbs. annually. Taking eight pounds of milk for a pound of cheese, as the standard, we get an average for a herd of Jersey cows and heifers of 572½ lbs. of cheese per cow.

For the purpose of seeing what may be done by an individual cow, I will take the cow in our dairy which makes the best milk record the past year. Her record is 6,835 lbs. of milk, which made into cheese would, by the rule adopted above, produce 854 pounds of cheese.

These estimates must be very nearly correct, as they are based upon the actual yield of milk, and the amount of Jersey milk from which a pound of cheese has been made.

I cannot say that this may not be a better yield than is obtained from the average Jersey cow; but, in the absence of other records, we must presume that this is a fair average of a well selected herd of Jerseys.

It is objected by some, that the Jersey is too small. This objection does not hold good until it can be shown that a larger cow will yield a quantity of milk in proportion to her size, or that it is profitable to maintain an extra live weight through the period of the cow's usefulness, for the sake of a few extra pounds of beef.

The cost of keeping a cow is said to be about 2½ lbs. of English hay per day, for every 100 lbs. live weight, which, for a period of ten years, would amount to over 4½ tons, which, at $8 per ton, would be $36. If it is profitable to raise beef at $36 per 100 lbs. live weight, then it is profitable to keep large dairy cows for the sake of the beef they will produce when their usefulness is past—not otherwise.

One of the advantages of a small cow is, that not requiring so much food, she has more time to rest, and the more rest a dairy cow gets the better.

It has been the ambition of some to combine beef and dairy qualities in the same animal. A cow may, to a certain extent, possess qualities which will make her useful in the dairy and suitable for beef; but the highest degree of perfection in either case can only be obtained by a system of careful breeding for the special purpose for which she is to be used; and whoever will succeed, must adapt his cows to the particular use for which they are intended, and to the soil and climate which indicates that use.

There are physiological reasons why a cow cannot combine in the highest degree the qualities of a dairy cow and that of beef. As well think to combine the qualities of the race-horse and the plough-horse in the same animal.

Food converted into fat in the beef cow is laid on the body in the parts where it is most useful, while in the dairy cow it is deposited in the milk, and when not in milk it is stored up inside for future use. The butcher will tell you that she "opens well," or, in other words, shows more fat inside than her appearance would indicate; but this store of fat is soon drawn upon when the cow is again brought into milk. It is her bank reserve.

The surplus food which a healthy cow eats will either be given out in the fat of milk or stored up in the system; and the cow which shows her condition best is, as a rule, the poorest cow for the dairy. One cow may deposit 400 lbs. of fat in

the milk pail, while another lays it on her back. One is for the dairy; the other for the shambles. A good dairy cow, when well fed will respond promptly by an increased flow of milk—a characteristic possessed in a remarkable degree by the Jersey cow. A beef cow will respond by an increase of fat.

It is thought by many that our native stock is best adapted to the general purposes of the dairy; but this is not conceded by those who have tried both Native and Jersey. I know that a well-bred herd of Jersey cows has produced 40 per cent. more butter in a year than is claimed for the best herd of Native cows that I have ever heard or read of.

True, our native or common stock might be improved, if as much pains were taken as with the thoroughbred; but would it be wisdom to go back two hundred years, when we can avail ourselves of the progress already made? I believe that we should "prove all things," and I also believe that it is wisdom to "hold fast that which is good."

The Jersey is also susceptible of improvement, and in the hands of judicious breeders, has been much improved in this country; but the breeder who undertakes to improve his stock, be they Native or Jersey, by breeding for the color of the hair, tongue or switch, will be far behind in the race.

The breeder of trotting horses does not look at their tongues, nor their tails, to see whether or not they possess speed, but is guided by the best second of time: and the breeder of dairy stock will act wisely who ignores fancy points, makes indications secondary to the actual performance, and breeds for and from the cow that produces the most pounds of butter, cheese or valuable milk.

It is not the fluid portion of milk that is valuable, either for butter, cheese, cream, or as milk for family use.

A cow may, like "Old Creamer," give a barrel of milk per day and be of little practical value; or she may give five gallons per day, and with good "staying qualities," make 365 lbs. of butter in a year.

We find a few cows—mostly of the Jersey breed—which have produced over 500 lbs of butter in a year—quite a number which have produced over 400 lbs. "What has been done can be done;" and I hopefully expect to see herds of Jerseys with an annual butter record of 365 lbs. per cow before many years. In fact, it would be difficult to place a limit to the possible cow.

One great merit of the Jersey breed of cattle is the value of Jersey bulls to improve our common stock. Next to the pure Jersey, grades from good native cows, by a Jersey bull, are the most highly prized of any cows in the neighborhood in which I live.

One of the strongest evidences of the superiority of the Jersey is the fact that, in spite of her diminutive appearance, she

has lived down prejudice and now stands the most popular dairy cow in this country.

The Jersey cow is long lived, suited to a variety of conditions and climates, is a hearty eater, and responds promptly at the pail to a generous diet. She is contented and remarkably docile, excels in the production of butter, and, as far as she has been tested, the indications are that she is equally valuable for the production of cheese. She yields a large quantity of milk in proportion to her size, and all her products are of a superior quality. In fact, one of the greatest merits of the Jersey cow is the superior quality of her products; and for this class of goods there is always a demand at remunerative prices. We may have an over-supply in quantity, but there is always a good demand for the best, whether in milk, cream, butter or cheese, and the dairyman who has a good herd of Jersey cows need not lose any sleep over oleomargarine.

HOLSTEINS FOR THE DAIRY.

BY SOLOMON HOXIE.

About fifty years ago, Dr. Sturm, a celebrated European author on domestic animals, proposed the general classification of the cow, by races, as follows:

The Lowland Race.
The Highland or Middle Race.
The Mountain Race.

This classification is now extensively adopted. Each of these races is sub-divided into breeds.

The author above mentioned regarded the Lowland race as the primative one, and the Dutch-Friesian cow as the best type then existing. It is on this breed of cattle, that has become, through peculiar circumstances, known in this country as Holsteins, that we are invited to prepare this paper.

Around the North Sea, on the continent of Europe, is to be found the Lowland race in its greatest perfection. It is there divided into breeds, more or less distinct, according to the qualities it has acquired in different localities, from long periods of varied use and manner of keeping. Nearly all are of large size, and black and white in color. John H. Klippet, Secretary of the Ohio Board of Agriculture, visited Europe in 1865 with the view of studying its various agricultural interests. He enumerates five different breeds of cattle belonging to the Lowland race. He says: "I found large black and white cattle in Holstein, recognized as Ditmarsh cattle; then I found another large black and white cattle, which I could barely tell from Shorthorns by their size and form, variously called Holland or Oldenburgers; then there is another black and white breed, known as Brietenburgers; and in Holland there are two strains of black and white cattle, *famous as milkers*, known as Beemsters, and other *famous milkers* known as Frieslanders." Although the term Holstein, with us, includes all these breeds, yet by far the greater proportion imported have been Beemsters and Frieslanders. Two Herd Books have been established in America. "The Holstein Herd Book" and "The Dutch-Friesian Herd Book"—differing mainly in the terms of admission of animals to registry.

The first modern importation was made by Hon. Winthrop W. Chenery, of Massachusetts. It consisted of a single cow. But the extraordinary qualities of this cow led to other importations, in '57 and in '59. "All of them, however, with the

exception of a single bull, were seized and destroyed, under a law of the commonwealth of Massachusetts." In 1861, Mr. Chenery made another importation, consisting of a bull and four cows. This was really the first permanent introduction of this breed, that has since then, in the brief period of seventeen years, become one of the leading breeds of cattle in the United States. They are imported chiefly from North Holland and West Friesland, two districts in the Kingdom of the Netherlands. North Holland has a territory of about half the size of Herkimer County, of this State, containing 928 square miles. Friesland has a territory of 126 square miles, being about as large as Oneida County. The permanency of the dairy interests of these districts can hardly be conceived by us, in America, so changeable are we in our occupations. Prof. Gerardus Johannes Hengweld, a noted author upon cattle, who occupies the chair of Breeding Genealogy and Clinics in the Royal Veterinary Institute, Utrecht, says: "These districts have bred the same cattle and used them for the same purposes for more than two thousand years." Prof. Roberts, of Cornell University, who has traveled through these districts during the past season, with a view of observing their dairy interests, says: "They have reduced the problem of cheap milk, butter, cheese, and beef production, the most nearly to a practical solution of any people in the world. Upon land worth from five hundred to one thousand dollars an acre, they successfully compete with our dairymen upon the cheap lands of America." He continues: "These Dutch farmers have grown rich in the dairy business. Their farms average in size from one hundred to one hundred and fifty acres, and average in value from twenty-five thousand to one hundred and fifty thousand dollars. Besides, they have other large investments, especially in United States bonds. To acquire as much in dairying we conclude they must have a good breed of cattle. Their wonderful prosperity is a proof of this beyond a question."

The climate of these districts has about the same extremes of heat and cold as Central New York, the thermometer ranging from 23° below zero to 102° above. The country is subject to dense fogs and violent gales of wind. The lakes and rivers are frozen over about three months of the year.

These districts, besides supporting a population numbering, in 1858, 815,407—six times as many as were in Oneida and Herkimer counties at the last census (1875)—export large quantities of beer, butter and cheese. The district of Friesland exports, in the single item of butter, an annual average of 5,000,000 pounds. This butter goes principally to the London and Liverpool markets, bringing the highest prices in competition with the best Irish, Welsh and Channel Island butter. Says Mr. John F. Seymour, of this city, a brother of Gov. Sey-

mour, who used this butter in England: "It is the best butter in the world."

Prof. Hengweld says: "The superiority of these cattle over all other dairy and beef breeds is acknowledged throughout entire Europe." Prof. Roberts, says: "The Dutch have the best breed of cattle in the world." I quote his language in an address before the New York Dairymen's Association, at Binghamton, in December last. He continued: "I took especial pains to compare their beef with the best English beef, and found it superior in quality." Mr. Wing H. Smith, who has spent some time in Europe, during the past year, says: "The farmers of North Holland and Friesland have found the happy combination of quantity and quality of milk with quantity and quality of beef." I refer to this because many suppose that these two qualities are incompatible with each other. Why any one should obtain this idea we cannot understand. The richness in milk and the fatness in beef come from the same constitutents of food. The fat in a cow is often changed into milk. The cow that is fat and grows poor from the process of milking, is simply using up her fat for milk production. If this is true, how can there be any incompatibility between the two qualities, except in point of time? The value of an animal for beef depends upon the parts in which or upon which the fat is deposited. A poor beef animal deposits the fat almost exclusively around the kidneys and upon the intestines. A good animal for beef interlards it in the tissues among the muscles. Now the milking qualities of a cow depend not upon where she deposits fat when dry. A cow that unites the two qualities of milk production and beef production is simply one that uses her food for milk, when in milk, and when dry, uses her food for fat and flesh, and puts it on in the right places. The Dutch claim that they have produced just such an animal, and the facts seem to bear them out in this claim.

These cattle, during their seventeen years' trial in this country, have gained ground more rapidly than any other breed, at its first introduction. They have proved themselves adapted to all the variations of climate, soil and circumstances of our country, thriving equally well on the soil of New England, New York, Virginia, Kentucky, the prairies of the West, and in the peculiar climate of California. Col. Hoffman, the owner of one of the finest herds in New York, never shelters them during the day, even in winter. Yet in his hands they are sleek and healthy, yielding enormous quantities of milk. Mr. Gerrit S. Miller, on the highlands of Madison County, is equally successful. The Unadilla Valley Association have tried them among the hills of Otsego County and in the Mohawk valley, with the same success. During the past season, the members of this association have milked about thirty-five grade two-year

old heifers, running together with grade cows of other breeds, with precisely the same care and feed, and in every instance the grade Holsteins have proved themselves superior. Prof. Hengweld, says: "They acclimatize in all countries with but little or no change in their productiveness. The cattle imported a hundred years ago into Anspach, the cattle sent to Bremen, Holstein, Berlin, the Dutch cattle in Hohenheim and Rosentein, the Bohemian Dutch cattle, and these cattle in France, Germany, Russia and lately in America, are so many evidences of this. They all retain their original form, colors and qualities." The first quality that we will mention, commending them for the especial uses of the diary, is their wonderful docility and quietness of disposition. The bulls rarely ever become cross at whatever age, and under whatever treatment. The cows rarely ever fight or push one another in the yards and fields. Dr. Bingham says there is no more hooking among the dairy herds in Holland, than among so many flocks of sheep. Indeed it is difficult to determine the master cows of a herd. I have frequently seen three and even four of them drinking together out of the same tub, eight feet long and two feet wide, which they could approach only upon one side and one end. They are very social, displaying extreme fondness for one another. In Holland, they are the family pets, kept under the same roof, in winter, with the family, fed and fondled by the wife and children, as the house dog is petted and fondled in this country. They are kept in the common summer eating room, only separated by a partition and door from the sitting rooms, parlors and sleeping rooms of the family. The neatness with which they are kept is something wonderful. Prof. Roberts says: "On my return, I told my wife that I had dined in Dutch cow stables that were kept neater than the parlors of the ladies in America. Dr. Bingham says every cow has a window in front of her stall, and it usually has a lace curtain. This association with man, and the kindness of their treatment during many generations, have developed in the breed remarkable intelligence and docility of disposition, and in these qualities lies much of their superiority for the dairy. The food of a cow goes for three purposes: the production of milk, when in milk; the production of flesh and fat, when dry; and at all times a certain amount of food goes to the sustenance of life and the production of nervous energy. This last item is the most exhausting and expensive item of all, as may be seen in cows that fail to give milk or put on flesh, when kept in a state of extreme activity or anxiety. That breed of cows that uses up proportionately the least food in nervous energy, that will use its food the most perfectly in the production of milk, when in milk, and in the production of beef, when not in milk, is the one that our dairymen will find the most profitable. Hence,

in choosing a cow for dairy purposes, or a bull for propagation, selection should be made, as far as possible, from a breed that is quiet and docile in disposition, and at the same time industrious and intelligent. This brings us to another quality that especially fits the Holsteins for the dairy. They are industrious and good feeders. They like clover and blue grass, but they will freely eat swamp and sedge grass, if it need be. Anything that any cow will eat they will not refuse. A cow is a machine for the converting of the various grasses and other kinds of food into milk and beef. Now the cow that consumes and digests and converts into these products the largest amount, beyond her vital necessities, is the cow that is the most profitable. According to accurate experiments, that have been made in Europe, the larger breeds of cows use proportionately less food for their vital wants, and hence porportionately more of their food goes for milk and beef production. At the Agricultural Academy at Eldena, many experiments have been made and accurate accounts have been kept of the product of every cow, and the expense of keeping her. In a herd of twenty-two of this breed, called by them Hollanders, it was found they consumed, for every quart of milk, five pounds of hay, while the smaller Ayrshire breed represented by three cows, consumed nine pounds of hay to every quart of milk produced. Another experiment, conducted by Villeroy, between the Hollanders and the Devons, resulted in producing 28.92 quarts of milk for 100 pounds of hay, from the Hollanders, and 19.13 quarts of milk for 100 pounds of hay from the Devons. Baron Ockle, in Frankenfelde, made a comparative experiment between Ayrshires averaging 806 pounds in weight, and Hollanders averaging 1,016 pounds in weight. The smaller breed consumed 33.10 of hay to 100 pounds of live weight, while the larger breed consumed 28.10 pounds of hay to 100 pounds live weight. The same gentleman experimented with cows of the same breed, with the same result as with different breeds, the lighter cows consuming relatively more food than the heavy ones. So we say the larger the breed, if not so large they cannot successfully pasture, the more profitable to the dairyman. Prof. Hengweld divides the Holsteins into three sizes: The large, medium and small. Judging from our own observation, the medium sized cattle of this breed, weighing from 1,000 to 1,300 pounds, in good milking condition, are better adapted to New England, New York, and some portions of Pennsylvania and Ohio, than the extreme large sized, while the larger animals are adapted to the prairie of the West and the blue grass region of Kentucky.

From many experiments, the breeders of Holsteins in Europe and America alike conclude that they will produce from given quantities of feed larger quantities of milk, butter, cheese and beef, than any other breed. Prof. Hengweld says, (we

quote from him because he is one of the best informed and one of the most candid writers upon cattle): "Much pains has been taken in foreign countries to keep an account of the quantity of milk yielded by the Dutch cows, and to compare it with the yield of the most productive breeds of other races. In the yearly quantity of milk yielded by the Bern, Simenthal, Allgan, Limburg and Ayrshire cattle, comparisons have been made. In some instances, the result has been in favor of the Bern, Simenthal and Allgan breeds, but generally the superiority is with the Dutch, Limburg and the English breeds, in which we include the Ayrshire, cannot be compared with them. In my description, says he, "of South Holland cattle I have given 3,500 litres as the average yield, (3,698 quarts, or reckoning a quart to weigh $2\frac{1}{8}$ pounds, 7,858 pounds). But," he continues, "this quantity cannot be accepted as the yield in North Holland and Friesland. It is stated by many a landowner or farmer that, from time to time, their productiveness amounts to 5,000 or 6,000 litres. Cows yielding these quantities are not at all rare."

Let us get these figures in our minds—5,000 to 6,000 litres: $5,283\frac{1}{2}$ quarts to 6,340 quarts, or 11,227 pounds to 13,473 pounds. Reduce these quantities to cheese or butter, at an estimate of ten pounds of milk to a pound of cheese, or twenty-five pounds of milk to a pound of butter, and we have of cheese $1,122\frac{7}{10}$ pounds to $1,347\frac{3}{10}$ pounds; or of butter, $447\frac{2}{25}$ pounds to $538\frac{23}{25}$ pounds per cow. Is it any wonder, with such statements before us, that Friesland, with a territory about as large as Oneida County, is able to feed its large population and export an average of 5,000,000 pounds of butter yearly? As large as these yields are, they have been equaled in some instances, in this country and in a few cases exceeded. Gerrit S. Miller reports three cows, respectively milked four, five and six years, an aggregate of fifteen years, giving an average of 8,738 pounds of milk per year. The largest yield of a single cow during one year was 14,027 pounds. Col. Hoffman reports having milked this past year six full-bred cows and four grades that have averaged 8,740 pounds of milk. He says one of his cows has averaged 11,680 pounds per year, for three consecutive years. A heifer of his, commencing to milk at two years of age, for three consecutive years averaged $8,713\frac{1}{2}$ pounds per year. Hon. Wm. A. Russel, of Lawrence, Mass., reports a cow that, in 1875, gave 16,274 pounds, in 1876, 12,274 pounds, and in thirteen months, from May 1, 1877, to June 1, 1878, 13,232 pounds. The Unadilla Valley Association reports a cow that gave $26,905\frac{1}{8}$ pounds in two years, the largest record for one year being 14,312 pounds. They report the yield of three two-year-old heifers, of course with their first calves, as follows:

Weight of first heifer, 972 lbs.; record, $10,711\frac{5}{8}$ lbs. of milk, giving over eleven times her live weight.

Second heifer, weight, 999 lbs.; record 10,430¼ lbs. of milk, giving over ten and one-half times her live weight.

Third heifer, weight, 926 lbs.; record, 10,228⅝ lbs., giving also over eleven times her weight.

The first volume of the Holstein Herd Book refers to one dairy in Europe, of 190 head, that averaged 4,076 quarts of milk; reduced to pounds, it gives us 8,661 lbs.

With these facts before them, the Dutch-Friesian Association of America has fixed the minimum yield of 8,000 lbs. of milk to entitle a cow to registry in its Herd Book.

In regard to the quality of milk yielded by this breed, we again quote Prof. Hengweld. He says: "Another characteristic ot these cattle is the richness of their milk. This also has been examined and compared with the milk of other breeds—sometimes, however, without regard to the many circumstances on which depend the percentage of cream and butter—viz: constitution, age, manner of feeding, time of calving, milking two or three times a day, milking dry or not, morning's or evening's milk, dry or green fodder, winter or summer time. All this waiting for a closer examination, it may be said with a degree of certainty, that only the mountain cattle races, including the small Alderney cattle, possess a higher percentage. The importation of mountain cattle into our low countries has led to no favorable results. The caseous or cheesy matter in the milk varies from 8 to 16 per cent., the butyraceous or fatty from 2½ to 4½ per cent., depending on the various circumstances. Compared with the fat milk of the best foreign cattle, the difference is but slight. The average cipher for the quantity of cream is 10 to 11 per cent., with which the butyraceous quantity of 3 to 3½ corresponds. Baumhauer's experiments show a difference of cheesy and butyraceous matter of 0.210 to 0.469. From these facts, we see that the quantity of butter is such as to allow our best milch cows to vie with any other breed. Caseine, butter and sugar of milk are to be found in their milk in as large quantities and of as excellent quality as in any other milk breed, with the exception of the Alderney, and possibly some of the mountain cattle, which they greatly surpass in productiveness."

In America, we claim that they give a quality of milk averaging with the Ayrshires and Shorthorns; but that from a given quantity of feed, they will produce more than any other breed.

We give the following from the pen of L. S. Hardin, of Kentucky: "Contemplating publishing a pamphlet on Modern Butter Making, I have written to all the famous breeders of dairy stock in this country to try and get information sufficient to settle the vexed question as to which is the best butter breed. From the best information I can get, I have made up the following table:

NAME OF BREED.	No. of Cows in Herd.	Lbs. of Milk per Cow per annum	Lbs. of Milk to 1lbs. of Butter.	Lbs. of Butter per Cow per year.
Short Horn	28	Actual.	.....	252½
Ayrshire	11	5,469	25	273
Jersey	14	5,625	20	281
Natives	17	Actual.	.....	302
Holsteins	12	8,767	25	350

The basis of this table is the yearly yield of a herd of not less then ten cows." He further says: "I have tried to show no partiality, and will be thankful to any one who will point out errors, or produce better records."

Mr. George H. Babcock, Secretary of the Brookfield Agricultural Society, tested the butter qualities of the herd of the Unadilla Valley Association, while they were on exhibition at the Brookfield Fair, October 2, 1878. He tells the story in the Brookfield *Courier*, as follows:

"There were fourteen head from this herd at the Brookfield Fair this year. October 2d, five of the cows were kept on my farm during their stay in town. The milk was put in the dairy with the milk from my own cows; but 68 pounds of the Dutch cows' milk was kept separate and the cream allowed to rise and was skimmed when the milk was sour; the cream churned by itself in a common 'dasher' churn, and the result was as follows: Three and one-half pounds of butter to the 68 pounds of milk, or one pound of butter to 19$\frac{3}{7}$ pounds of milk. The butter was weighed before salting, the milk having been thoroughly washed from the same; and this milk was mostly from the two cows above mentioned, the 'Maud' and 'Jacoba,' the cows which give a large quantity of rich milk. Jacoba was giving while here nearly fifty or fifty-five pounds per day. The above trial was made without the knowledge of any member of the association, and simply for my own gratification. The result was so unexpectedly satisfactory that we will give the above facts and figures."

Col. Hoffman, writing to Mr. Wing H. Smith, of Syracuse, says: "The monthly tests by cream gauge and lactometer, which I have made of each and every cow for the last three years, have proved to my mind that my herd yield milk fully as rich in cream and butter, and much richer in caseine, than that of the common cows of this country. I am now (July), and have been for the last month, with very poor and unsuitable conveniences for making butter, getting about two lbs. per day for each cow. The butter is packed in ordinary pails, of about 70 or 80 lbs each, and is selling in New York at 41 cts. per lb."

The average test of cream gauge during the past season in Col. Hoffman's herd was 12.85 per cent. On Tuesday morn-

ing, January 7, of last week, we milked one of the heifers of the Unadilla Valley Association, that dropped her calf December 2. She gave 24½ lbs. at that milking. We tested it in the cream gauge, in the open air, temperature, 10 above zero. At 2 o'clock P. M. it was frozen, but showed twenty-five per cent. cream. We took it into the house and reduced it to a fluid state, when it stood at 12 per cent. We have tested with cream gauge many times during the past three years, cooling the milk to the moderate temperature of 55 degrees to 60 degrees, and getting from 10 to 14 per cent. cream. The same milk tested in this city, in other hands, gave 18 per cent. Our faith in the cream gauge is very weak. By rapidity in cooling to a low temperature, milk may be made to show in the gauge from four to six parts more cream than if cooled more slowly. The true test is either by analysis of the milk, or actual butter making. A few such tests of Holstein milk have been made in this country. A two-and-a-half year old heifer of George E. Brown, of Illinois, by analysis, yielded, in 100 parts milk 63 parts pure butter. Four cows of Mr. Chenery's herd yielded in 1,000 parts, pure butter as follows: No. 1, 47.50; No. 2, 33.96; No. 3, 32.50; No. 4, 40.23. No. 1 actually made 17 lbs. and 14 ozs. of butter in six days, nearly three pounds per day.

We have already briefly referred to the beef qualities of this breed. We think the time is not far distant when our dairymen at the East will have to consider the subject of beef production, in connection with cheese and butter production. This idea may now be scouted. But the dairy region, that we used to think confined to a few counties in New York State, is expanding indefinitely. The prairies of Illinois, Wisconsin and Indiana, where we supposed it impossible to produce good cheese and butter, are already successfully competing in the production of the best qualities. Virginia, Kentucky, Missouri, Texas and California are beginning to have their cheese and butter factories. Feeding cattle for beef is even now the more profitable business. Dairymen in New York milk their cows from eight to ten years, then they are almost entirely thrown away, the West in the meantime supplying them with beef. After a time, we think they will discover that it is not profitable to throw away their cows, and they will then milk them a shorter period, probably from four to six years, and fatten them for the shambles. In this way of handling, there will be no loss from worn-out cows, and we have no doubt as good quality of beef will be furnished our markets from this source as now comes cruelly bruised and famished over our railroads from the West. The idea that a cow cannot be used for both milk and beef will then be discarded; and the Holsteins will be universally acknowledged possessed of qualities fitting them for yielding the highest profit, both at the shambles and in the dairy.

PROFIT AND LOSS IN DAIRYING.

BY T. D. CURTIS.

Dairying, which for nearly fifteen years, led all other branches of agricultural industry, has finally found its level. It can no longer count on larger profits than other branches. Instead of multitudes rushing into it, the order of desertion has begun. Those who have poor advantages for carrying on the business, and those who do not understand it, or are not adapted to its pursuit, are, of necessity, beginning to look for something else. To such, there is no profit in dairying, at present prices. If there does not follow any material contraction in the volume of dairy products, we may confidently expect that the rapid increase of the last decade will cease. It is no longer profitable to rush into the dairying business with scrub cows and worse conveniences. Scrub cows and scrub dairymen must go by the board, and we shall witness a survival of the fittest.

The present overloaded and depressed condition of the dairy markets will not prove an unmitigated curse. It will cause many to forsake dairying who never ought to have gone into the business, and who engaged in it in a loose, speculative way, and have generally thrown inferior products on the market—thus injuring themselves and others; and it will lead others to study closer economy in the production of milk and its manufacture, and the building up of home markets for both milk and its products. We must have cheaper production, better quality, and wider markets. How are these ends to be attained? This is the question which I propose to briefly discuss.

How can we secure cheaper production? There are only three available means within our reach. One is better culture of the soil, thereby securing greater production for the labor expended. We must work less land, work it better, going over less surface for larger crops. It is a notorious fact, in Europe and America, that, as a general rule, the larger the farms the more poorly are they cultivated and the less is the yield per acre. The converse is of course true. The smaller the farms the better are they cultivated and the greater is their average productiveness per acre. In England and Wales the average product per acre of the one-acre farms is £192 14s., or about $960. The average product per acre of the one to ten acre farms is £13 9s., or about $66; and the average productiveness per acre declines to £1 8s. for the five to twenty-acre farms, and 19s. to 18s. for the 50,000 to 100,000 acre farms.

In Scotland, where the monopoly is proportionately greater, the average productiveness per acre declines still more rapidly. The one-acre farms average £205 17s., or about $1,025 per acre; the one to ten-acre farms average £48 17s., or about $240 per acre; the ten to fifty-acre farms average £10 17s., or about $52 per acre; the fifty to one hundred-acre farms average £4 8s., or about $21 per acre; and then follows a steady decline of the average product per acre to 3s When the farms reach the size of 1,000 to 2,000 acres, the average product declines to £1 8s.; and when an area of 5,000 to 10,000 acres is reached, the yield is less than £1 per acre.

We have no such marked unequal distribution of the soil in this country, nor any such excessively large farms. But we are trying to cultivate too much soil, and, as a consequence, cultivate it poorly and to very small advantage, if not at an actual loss. We ought to cultivate less, cultivate it thoroughly, and find an increased production in it. This would be, in effect, to cheapen production.

It is sometimes said that we must have cheaper labor, and the idea seems to prevail that this would cheapen production. But this is not so. The cost of production should be measured by the amount of labor expended. The individual may find an increased profit by taking it out of the wages of the worker who is compelled to work by the day, week, or month. But there is no profit to the community or the nation. Production is not thereby increased, though its fruits may be cheapened to the consumer by starving the worker. Real and general profit must come, not by cutting down wages, but by means of increasing production, which will operate to give the worker more of the products of labor when he goes into the market with his wages, to buy. The true object is to secure a greater reward to all useful labor, and not to benefit one class of community by cutting down the rewards of another.

Legitimate progress may be made and substantial advantage gained by improving and inventing labor-saving machinery, by better and simpler methods of culture of the soil, and manufacture of milk, by increased and cheaper facilities for marketing, and by securing greater conveniences of all kinds. Many things are done at great disadvantage and with loss of labor for the want of a little forethought in planning and arranging work, or the want of the investment of a few dollars, and possibly only a few shillings, in an implement, tool or convenience which will save a little labor every day, and in the aggregate a large amount during the year. In short, we must put more thought into our work and into the methods of employing others, so as to get the greatest possible results out of the labor expended. Much loss might be saved or profit gained by a judicious employment of brain in laying out work and planning conveniences for its accomplishment.

The quality of dairy products can be improved in many ways. Poor products not only bring less money in the market, but I think they cost more labor. As a rule, if we do everything at the right time, and in the right way, we shall do it at the least expense, as well as secure the best results. Dairymen must be honest and square with the world, avoid impoverishing their cheese by the use of the skimmer, and their milk for market by the addition of water. Almost anyone can add the water for himself. What consumers want is pure, rich wholesome milk. If they can be sure of this, they will consume milk freely; but lacking confidence in the venders of milk, they get along with the minimum quantity, whereas it is to the interest of dairymen to encourage maximum consumption.

Nothing would pay the dairymen of this country better than to organize for the purpose of furnishing cities and villages with pure, wholesome, unskimmed milk for general consumption. It is more wholesome and nourishing than the products made from it, and it is more profitable for dairymen to dispose of their milk in the unmanufactured state. It is in the power of dairymen themselves to drive out dishonest milk-venders, give the people of our villages and cities milk sweet and pure as it is drawn from the cows, and to thereby greatly extend the market for the products of the dairy. Is it possible to wake them up to a practical movement in this direction? If the citizens of New York could be made to feel secure against swill-fed milk, the skimmer, the pump and other impositions, they would very soon double their consumption of milk. And I believe this is true of every city and village in the land. With the increased consumption of such a nourishing and pleasant beverage, I believe there would be a decline in the consumption of the pernicious ones, and milk saloons might be made to take the place, in a large measure, of the beer and liquor saloons. There is philanthropy, morality and money in the increased consumption of wholesome, life-giving milk.

We can increase the quality of our milk by the careful breeding and selection of our cows, and by generous and proper feeding. Indeed, the greatest profit in dairying lies in this direction. It does not pay to keep poor cows, nor to keep cows poorly. By better culture of the soil and by keeping better cows and keeping them better, we can get along with tilling less land and keeping less cows without at all diminishing our production. And in this it will be seen there is true economy. We can get an improved quality of product by better culture and care, and save largely in labor by putting it on less soil and expending it on a less number of cows. Let us see if we can not illustrate this proposition in a way that will amount to a demonstration of its truthfulness.

I hold that half the cows of the country are kept without any profit to their owners and most of that half at an actual

loss. Many dairies that turn little or no profit to their owners might be made profitably remunerative by handing one-half the herd over to the butcher. The poorer half does not pay for the expense of keeping; and the profit on the better half is largely if not entirely consumed in making up for the loss on the poorer half.

We are told by good authority that the average annual yield of the cows of the country, is 3,150 pounds of milk, or 315 pounds of cheese, or 100 to 150 pounds of butter. Can any one, at present prices, figure out a profit on the average cow with such a yield? With butter at 25 cents, which is a high quotation for the season, 100 pounds of butter are worth $25; or 315 pounds of cheese, at 8c., are worth $25.20; or 3,150 pounds of milk, at 75 cents a hundred—which is a fair average for this season—is worth $23.62½. Can any one keep a cow for this sum, counting the manure as pay for the labor of feeding and care, without loss? Is it not evident that the dairies of the country are run at a loss? Bear in mind, we are speaking of the average yield per cow for the whole country. Though exceptional dairies may return a profit, it is evident that the majority show a balance on the other side. Is it any wonder that dairymen have "hard times?"

I hold that a cow which gives less than 5,000 pounds of milk annually does not pay for her keep, at present prices for dairy products. At 75 cents per 100 pounds for milk, 5,000 pounds bring a return of $37.50. Can you keep a cow through the year and find a profit in this? Yet, how many dairy cows are there that give 5,000 pounds of milk during the year? This is an average of nearly 17 pounds a day for 300 days; or 20 pounds a day for 250 days; or 25 pounds a day for 200 days. What proportion of dairy cows do this?

Every cow in a dairy must go above 5,000 pounds of milk yearly—an equivalent of 500 pounds of cheese—to afford any profit to her owner. And I understand dairies are run for profit rather than pleasure. Do one-half—the better half—of the cows in the country, yield a profit? Possibly; but I doubt if a larger proportion do. If, then, one-half the cows are kept at a loss, and only one-half yield a profit, it is plain that the loss of the poorer half must be made up out of the profits on the better, and the net profits are reduced by the amount of the loss on the poorer half. Then it is self-evident that the way to increase our profits is to kill one-half the cows, which are as good for beef now as they ever will be.

But how would such a destruction of our cows affect the volume of our products? It would reduce them, of course, but not one-half; probably not over 25 per cent., if as much as this. We can dispose of one-half the cows in the country and still turn out three-quarters the amount of dairy products that

we do now. The 25 per cent. would be but a healthy reduction. Then, too, in disposing of the poorer cows, the reduction of products would be mainly of the poorer kind—for the poorer cows are apt to yield an inferior product—and the poorer products are what we want to get rid of. The volume of the best products would be but slightly reduced. We get the best products from the best cows, kept in the best manner. The owner feels that he can afford to keep them well; and here instinct and judgment unite. He *can* afford to keep a good cow well, and he *can't* afford to keep a poor cow at all.

Now let us suppose an average dairy of 50 cows—that is a dairy that will average a yield of 3,150 lbs. per cow, during the year—and see what the receipts will be. If we multiply 3,150 by 50 we have 157,500 pounds of milk, worth, at 75c per 100 pounds, $1,181.25. Suppose we dispose of one-half the herd, reducing the number to 25, and thereby increasing the average yield per cow to 5,000 pounds a year. This gives us 125,000 pounds of milk, worth $937.50. In reducing the cows one-half we have reduced the receipts, not $590.62½, or one half, but $244.75. Nor have we reduced the receipts 25 per cent., which would be $297.06¼, but only $244.75, or less than 20 per cent.

So much for the receipts. What have we done in the way of saving? We save one-half the room in the stable, we save one-half the time in milking, we save the handling of about one-fifth the product, we save one-half the hay and other feed, and we save one-half the pasture. We also save one-half the capital invested in the cows, and one half the risk, with some saving in the amount of apparatus. Suppose it costs $37.50 to keep a cow through, as I have assumed, we save $937.50, and lose $244.75. We have saved $692.75 more than we have lost—and this is a larger profit than most dairymen are able to count at the end of each year.

This shows that it will pay to weed out the dairy herds of the country very thoroughly; and that by doing so, even to the extent of disposing of one-half his cows, provided the other half are such as will pay, the dairyman who now comes out even at the end of the year may secure a profit, and he who now finds a loss in his account may put the balance on the other side.

I will not pursue this subject farther; but, having given this broad hint, leave each one to work out the problem for himself. We must raise the standard of our stock, make our acres more productive by cultivating less of them and doing it better, and we must avail ourselves of every improvement. There is no profit in the ordinary or average cow, and I am glad to see so many intelligent efforts made to improve our dairy stock. Instead of two, three or four thousand pounds a year, we are be-

ginning to talk of eight, ten and twelve thousand pounds of milk. The Unadilla Valley Stockbreeders' Association, which owns the celebrated Friesian or North Holland herd, refuse to keep for breeding purposes any cow that does not make a record of 8,000 pounds. Such a cow would yield a profit. At 75 cents a hundred, her milk would bring $60. Most of the herd go considerably above this. The Maid of Twisk has a record of over 14,000, worth $105, at present prices. But there is loss in any milk machine below 5,000 pounds capacity, and no profit under a capacity of 6,000 pounds.

What I have said applies only to the common dairy herds of the country, and not to herds giving milk of exceptional quality. It should be borne in mind that improvement in quality is equivalent to increase in quantity, though increase in quantity may not be an actual improvement. It is no improvement if made at the expense of quality; but when the quality can be kept up, of course there is real gain. What the dairyman needs is the cow that will convert the most food into the most milk of the best quality.

MARKETING CHEESE.

BY DR. L. L. WIGHT.

Were all of our cheese product a perfect article, and did the vender and the purchaser acquiesce in the principles of gauging the price by the supply and demand, the process of marketing cheese would become very simple and very satisfactory. Although these conditions are impossible, at least at present, still, the nearer we can approach to them the more the burden will become a pleasure. The first essential prerequisite is the production of an article which will rank with the best products of its kind in any country. It is admitted that at present the finest qualities of cheese in England outrank our finest qualities by at least three-eighths of their market value. When the finest American cheese will bring fifty shillings per. one hundred and twelve pounds on the English market, the best qualities of their own production will readily command eighty shillings. Could the American producers realize the highest prices paid for English cheese, their profits would be enhanced more than three-eighths, as the cost of production would be raised but little. Perhaps, owing to the difference in climate and soil, we may never be able to arrive at that state of perfection reached by our brothers across the water; but we may certainly approximate it, as is clearly shown by the very great difference in quality and in price of those cheese which are made at our best, and our poorest, factories. I have at times been greatly nonplussed at the fact that we have not been able to successfully compete with the foreign make, and have often asked myself the reason, especially when I reflect how superior our citizens are becoming in the power of invention and mechanical skill. That the cause of our inferiority does not lie wholly in the lack of skill in our manufactures is shown by the fact that persons from abroad who in their own country could produce an article second to none, coming to America, find that the cheese they make here is in no way superior to that of our best home manufacturers. Again we sometimes find specimens of American cheese almost if not quite equal in quality to any of the English product. My investigations have led me to the conclusion that the main barrier in our way is the want of care, cleanliness, and attention to details among our milk producing farmers. Would every patron of a factory be scrupulously neat and clean in every particular, cooling and airing the milk as soon as drawn

from the cows, and not allowing it to absorb any objectionable odor, I feel certain that a wonderful progress would be made. Our manufacturers also oftentimes lack that degree of training in their calling which is essential to success. Although the process of cheese making has now become strictly mechanical, yet I know of no occupation which requires more thorough watchfulness, care, and patience. Scales, and measures, thermometers, and hot irons avail little in the hands of untrained, careless and negligent persons. Thus it seems that the remedy as to quality must be found in a more thorough and systematic drilling of our milk producers, first, and next of our cheese manufacturers. Could these parties themselves but realize the vast importance of these things and the immense loss now sustained by their present inadvertence, they would surely most gladly hasten to remedy the defect. I apprehend that if some one factory should compel its patrons and maker to adopt this course, its superior success would teach others the better way. Now, having a good article to dispose of, what is the best method to adopt? The markets at Little Falls and Utica, which I suppose are representative of all our inland markets, have fallen into a certain routine of procedure, which I apprehend might be very advantageously modified. Whether this be possible or not is a very pertinent question.

At those markets no price is usually placed upon his commodity by the salesman, but the bid of the buyer is accepted conditionally; that is, if no other buyer shall raise the bid one-eighth of a cent a pound before the close of the market. When a salesman finds that he is not likely to obtain a higher bid, he accepts the offer, and the bargain is closed. Thus you perceive that the mode of procedure is not like that of an ordinary business transaction where the vender places a certain price upon his commodity; nor is it a public auction, nor a dutch auction, but a peculiar mode into which the markets have fallen. A change of system to a public auction at a certain hour, would be a great saving of time, and avoid the annoyance of much higgling; and the sharper competition thus engendered would result to the benefit of the salesman. Another objectionable feature which has crept into our system of marketing, and threatens to undermine it, is that an increasing number of our members frequently sell at the market price, as it is called, which is to be determined by the published report of the market; and is either the extreme high, or the leading, or the average, and sometimes this is carried so far as to be above the extreme—that is above any quotable price. Sometimes the majority of the better class of factories have thus sold without any price whatever having been established Now it is clearly to be seen that by this system many of the better class of factories are virtually withdrawn from competition, leaving

the entire market prices to be established by the sale of the more ordinary factories. Furthermore, very many non-members throughout the country base their entire season's transactions upon the reports of these markets, and neither aid in supporting the markets, or ever come to the meetings of the Associations. Inasmuch as competition among buyers is the life and soul of our organizations, without which they would become lifeless and cease to exist, it is very evident that this method of marketing our produce is unwise and even suicidal on the part of the salesman; in fact it has already brought about such a condition of things, that some fine manufacturing establishments sell through the season at a certain fixed price above the highest market quotations. The injustice of this method manifests itself when we see that many factories take advantage of this system, and refrain from joining or supporting the market, but still sell regularly on the market, as it is called; that is, the prices of their sales are fixed by the prices actually made by the market. Under this state of things the only redeeming feature which has saved our organizations from being entirely swamped, has been the unusual honor, magnaminity, and business-like character which has characterized the major part of our cheese buyers. I would say in behalf of the members of the organization with which I have been most intimately connected since its inception, that in the main, both buyers, and sellers, are the most upright, honorable, genial, and admirable set of men with whom I have ever been publicly associated. As the cash system has prevailed in the Utica organization, there have never been any losses sustained by its members from the misfortunes or failures of any purchasers, that I am aware of. Should these brief hints tend to improve the quality of the product in which we deal, and to remove some of the objectionable features in our present system of marketing, the writer will be abundantly rewarded.

PRINCIPLES OF FEEDING.

BY PROF. W. R. LAZENBY.

If we make a chemical examination of the body of one of our higher animals, we find it to consist principally of the four elements, carbon, hydrogen, oxygen and nitrogen. Every one hundred weight of the animal body contains, approximately, 14 pounds of carbon, $9\frac{1}{4}$ pounds of hydrogen, 72 pounds of oxygen and $2\frac{1}{4}$ pounds of nitrogen. Besides these organic elements, our 100 pounds contains about two and one half pounds of other elements called inorganic. These consist principally of the metals calcium, sodium, potassium and iron, and the non-metallic elements sulphur, phosphorus and chlorine, although these last named elements form so small a proportion of the whole weight of the animal body, they are just as essential to life as the organic elements that exist in so much larger proportions. To illustrate, the bones are composed in equal parts of these two classes of elements, nearly one half of their weight being made up of phosphorous and calcium. Understand that these elements of which we have been speaking, are not found free or pure in the body but are united together, forming a vast number of compounds out of which the various organs and different tissues of the body are made up. The principal of these compounds are *water, gelatine, albumen and fat.*

Taking our one hundred pounds as before we find it composed of about 72 pounds of water, $9\frac{1}{2}$ pounds of gelatine, $2\frac{3}{4}$ pounds of albumen, about the same quantity of fibrine and 8 pounds of fat. We thus see that water is an important constituent of animals as well as of plants, and must enter largely into the food with which they are supplied. Gelatine is found in the walls of the cells, in bone and membranes. When any portion of an animal is boiled in water this gelatine is dissolved, and when the water containing it is allowed to cool, it becomes more or less solid, forming what is called a jelly.

The glue that is obtained from the skin and feet of animals is only a coarse form of gelatine. Albumen constitutes the principal part of the muscles and the nerves of animal bodies. Like gelatine it contains all the organic elements, but differs in that it is more readily decomposed after death. Fat is a very important constituent of the animal body. It differs from the compound mentioned above, in containing no nitrogen and but little oxygen. It consists almost wholly of carbon and hydro-

gen, and this is the reason that fat will burn so well in the form of candles.

Unless this fat is constantly supplied in the food of animals, during cold weather, they burn the fat of their own bodies in order to keep up the warmth. There are in addition to the compounds I have mentioned, many others found in the animal body, which appear in the blood, the liver, the spleen and the various glands of the body. They indicate that during the processes of life and growth a vast number of chemical changes are going on, which are essential to the health and well-being of the body. Let us now briefly study the relationship that exists between the composition of the body of an animal and that of its food.

Something over a century ago, Beccaria of Bologna, broached the idea that animals are composed of the same substances which they employ as food. The food of the plant, however, differs from that of the animal. The plant takes up mineral substances, the chief of which are carbonic acid and ammonia, while animals take up substances which are formed in the tissues of plants.

The necessity for a constant supply of food to the animal body arises from the fact that the life of the animal depends on the continued use, and destruction of the particles of which the body is composed. This loss is sustained by every part of the body and must be supplied by food. We must bear in mind, therefore, that the food consumed is not used alone in the secretion of milk, but goes to maintain the growth and structure of the bones, flesh, blood, the fat, the skin, etc. These various parts of the body consist of different organic constituents. In some we find a large proportion of nitrogen, as the albumen of the muscles, fibrine of the blood, etc. Fat as we have seen is wholly destitute of nitrogen. Some parts of the body abound in inorganic salts. All these substances whether used for growth, or the reparation of waste, must be supplied in the food. For convenience then we may divide the essential uses of food into the following heads:

(1.) Value for growth.
(2.) Value for repair of waste.
(3.) Value for the production of heat.
(4.) Value for the production of power.

For growth, milk is the typical food. It contains one part of the nutritive or flesh-forming constituents, to two of the heat producing. In the growing state of an animal the nutritive part of the food not only supplies the place of the metamorphosed solids, but an additional amount of it is required, proportionate to the increasing size of the individual. Animal heat being generated by the destruction of fibrinous tissues, it is plain that

in the growth of the young there is a supply of heat from the casein, greater than that afforded by fibrine supplied to full grown animals, because the amount taken in proportion to the quantity of heat-producing matter is much greater. A very interesting fact in this connection is the remarkable departure from its ordinary composition, of the first milk yielded by an animal after the birth of its young. The milk is thicker and yellower, coagulates readily by heating and contains an unusual amount of casein. The following table exhibits the different proportions of the first milk of the cow, the ass and the goat, in some samples examined by Henry and Chevallier.

	Cow.	Ass.	Goat.
Casein,	15.1	11.6	24.5
Butter,	2.6	0.6	5.2
Milk Sugar,	——	4.3	3.2
Mucus,	2.0	0.7	3.0
Water,	80.3	82.8	64.1
	100 00	100 00	100 00

Under our second division, the value of food for the repair of waste, comes the question of special feeding for milk production. There has been a great amount of theorizing upon the effect of different kinds of food upon the quality of the milk, but thus far accurate experiments are wanting to establish any general principles.

Dr. Voelcker laid down the following proposition, that according to the purpose for which the milk is intended to be employed, whether for the manufacture of butter, or the production of cheese, the cow should be differently fed. Butter contains carbon, hydrogen, oxygen and no nitrogen. Cheese, on the other hand is rich in nitrogen. Reasoning from analogy we should conclude that substances containing the most fatty and oily matters, would, when fed to cows, produce the most butter. Hence, corn, oil meal, etc., should be fed to produce more butter in proportion to the cheese. On the contrary to produce a larger proportion of cheese, such vegetables or grains as contain a large amount of gluten and vegetable casein, or what are sometimes called protein substances, should be fed. Wheat bran and shorts, rye, barley and oats, are very rich in these substances. In this connection it may be interesting to note the close relation that exists between the chemical composition of gluten of grain, fibrine of muscles and casein of milk. More recent researches than those of Dr. Voelcker, have led some experimenters to conclude that no system of feeding could change the relative proportions of the different constituents of the milk, with the exception of water. That is, while the relative amount of these constituents varied for different breeds, and for different individuals, yet no method of feeding could increase the yield of butter from the milk of any individual cow without increas-

ing in the same proportion the cheese, the sugar and the salt. The latest experiments by Kühn, however, go to show that this is not altogether true, for he has proved that the relative proportion of the different essential constituents of the milk can be slightly changed by a varied system of feeding. With our present knowledge, the case seems to stand about as follows: The milking qualities of a cow are mainly inherited, and when there is nothing lacking in food that is needful to her most perfect development, any mere change or increase of this food, makes scarcely a perceptible change in the quality of the milk, though it may increase or diminish the quantity.

We have now to briefly consider the value of food for the production of heat. In a general sense the fat of an animal may be regarded as its store of fuel and its lean flesh to be the source of its motive power. The fat and oil of herbiverous animals are not only derived from vegetable oil and fat, but from starch, sugar, gum, cellulose and other non-nitrogenous but not fatty materials. Lawes and Gilbert have made many interesting experiments on this question. In the case of sheep fed upon fattening food, these experimenters found that every 100 pounds dry-non-nitrogenous matter consumed by them, produced on an average an increase of 10 pounds in the weight of their fat. In the case of pigs, also supplied with food, the proportion of non-nitrogenous substance appropriated to the animal increase, was double that so applied in the bodies of the sheep. Since the food supplied to these animals contained but a very small proportion of ready formed fat, it was inferred that at least four-fifths of the fatty increase was derived from the sugar, starch and gum. There is a much larger proportion of fat in the bodies of our domestic animals than is generally supposed, and the relationship between this fat and the fat in the food varies so much that it is almost impossible to determine with any degree of accuracy the quantity of fat forming material, which is required to produce a given weight in the animal.

Were one question in animal nutrition satisfactorily answered, it would then be comparatively easy to arrange the different cattle foods in the order of their value. That question is what are the proper relative proportions of the heat producing a fat-forming and the flesh or force forming constituents of the food?

The following table shows the approximate relation of nutritive to heat producing matter in a few of the more common articles of food:

Milk—(Food for a growing animal,)	1 to 2
Beans,	1 " 2½
Oatmeal,	1 " 5
Barley,	1 " 7
Wheat Flour—(Food for an animal at rest,)	1 " 8
Potatoes,	1 " 9
Turnips,	1 " 11

The following table shows the importance of paying due attention to the proper equilibrium of the constituents of the food. The first column in the table represents the food used by two cows, the second column gives the mean milk of the two animals for five days; the third the butter during periods of five days; while the fourth contains the amount of nitrogen in the food taken by both animals during the same period.

		Milk in five days.	Butter in five days.	Nitrogen in food in 5 dys
I.	Grass,.....	1.14 lbs.	3.50 lbs.	2.32 lbs.
II.	Barley and Hay,.....	1.07 "	3.43 "	3.89 "
III.	Malt and Hay,.....	1.02 "	3.20 "	3.84 "
IV.	Barley, Molasses and Hay,.....	1.06 "	3.44 "	3.82 "
V.	Barley, Linseed and Hay,.....	1.08 "	3.48 "	4.14 "
VI.	Beans and Hay,.....	1.08 "	3.72 "	5.27 "

These results show that grass affords the best products, for the reason that the nutritive and heat producing constituents are combined in the best proportions.

In this brief paper I have merely been able to hint at some of the elementary principles of feeding, yet I close with the trust that what has been said will induce some of our dairymen to make a more careful study of this important subject, and incite others to observe more closely and experiment more accurately.

THE COMMON SENSE OF THE SALT QUESTION.

BY HENRY A. MOTT, JR., PH. D., E. M.

For some time past my attention has been directed to a continued controversy on the "Salt Question," and having been urged by several of the most respected and distinguished investigators on dairy subjects, such as Prof. Arnold and the Hon. T. D. Curtiss, to take up the subject, I decided a short time since to make as thorough a scientific investigation as possible. I now ask your attention for a short time to the investigation I have conducted in search of the truths involved in this subject, which has engrossed the attention of dairymen for so long a time.

After giving to the subject considerable thought I planned a series of investigations which, in my opinion, were necessary to be solved before any accurate decision could be reached. The investigations were as follows:

First. To make a complete analysis of the prominent brands of salt offered, to ascertain if the composition of the salt offered at the present moment to dairymen in any way differed from the composition as reported by the last analyses.

Second. To dissolve a weighed quantity of each salt in a given amount of water, compare the thickness of the layer of scum, and second filter off the sediment, weigh the same, and calculate the per cent.

Third. To examine the odor and clearness of the solutions.

Fourth. To examine each salt under the microscope and otherwise examine the physical characteristics of the salts.

Fifth. Each salt will be sifted through a 13 mesh sieve, taking at least one sack of salt for each variety. The siftings will be collected and weighed and per cent. calculated. The pan scales will be separated from the same and weighed.

Sixth. A given quantity of butter will be made at one churning, and equal weights of this butter will be salted with equal weights of the various salts. So that each salt will not only have a similar product but the same quantity. The product

will be tested as to flavor and as to the preservative properties of each salt. And,

Seventh. The process of manufacture of each salt will be described and reviewed.

Before proceeding directly to the result of the first investigation, it appears proper for me to call your attention to the inability of science at the present moment to dictate the correct means of combining the various elements found in salt. A conventional method has been adopted by chemists to arrive at the required result; but that the method agreed upon is the correct one or leads to correct results, it cannot be definitely stated. I think in many cases where sulphate of magnesia is reported, part of the magnesia may be chloride, and where no sulphate of soda is reported part of the soda may exist in this state instead of wholly as chloride. Again if sulphate of soda is given in an analysis as also chloride of calciun, if such elements existed in the salt, on dissolving the same in water sulphate of lime would be precipitated by their union in a concentrated solution, but the precipitate would dissolve in the water in time. The elements I found in my analysis of each salt are therefore combined according to the conventional method, which is as correct as science is able to dictate to me at the present moment.

The following table contains an Analysis of the various salts I have examined:

ANALYSIS OF SALT BY DR. H. A. MOTT.

CONSTITUENTS.	Higgins.	Onondaga Excelsior Mills.	Stader Saline.	Ashton.	Deakins.	Worthington.
Sodic Chloride	97.820	97.712	97.682	97.596	97.483	97,462
*Water	*480	.431	.491	.493	.481	.496
Calcic Sulphate	14.82	1.583	1.603	1.692	1.698	1.703
Calcic Chloride	.....	.097	.121	.009	.....	.....
Sodic Sulphate	.....	.....	.....	.....	.121	.112
Magnesic Sulphate	.097	.032	.036	.092	.115	.097
Magnesic Chloride	.122	.071	.....	.076	.093	.....
Insoluble Matter	.025	.039	.036	.071	.061	.066
Total	100,026	99.965	99.969	99.959	100.052	99.936

* Water of Crystalization in all cases.

To compare my Analyses with previous Analyses by different Chemists, I have prepared the following tables:

HIGGINS' EUREKA FACTORY-FILLED SALT.

CONSTITUENTS.	Analysis by Dr. Mott.	Walty and Stillwell.	Dr. Brown.	Prof. Weber.
Sodic Chloride	97.820	97.6809	98.15	97.719
Water	*.480	.8260	.10	.809
Calcic Sulphate	1.482	1.2063	1.62	1.293
Calcic Chloride	.....	.....		.....
Sodic Sulphate	.....	.....		.049
Magnesic Sulphate	.097	.1616		.....
Magnesic Chloride	.122	.0311	trace.	.096
Insoluble Matter	.025	.0306	†.13	.034
Total	100.026	99.9365	100.00	100.000

* Water of Crystalization. † Other impurities and loss.

ONONDAGA FACTORY-FILLED SALT.

CONSTITUENTS.	Analysis by Dr. Mott.	Prof. Porter.	Prof. Goessman.	Prof. Weber.	Walty and Stillwell.	Dr. Englehardt.
Sodic Chloride	97.712	97.7603	98.28	97.415	98.3864	98.4173
Water	.431	.7236	.60	1.009	.9140	?
Calcic Sulphate	1.583	1.2952	.91	1.300	.7070	.8834
Calcic Chloride	.097	.....	.....	.102	.0296	.0213
Sodic Sulphate	.....	.0257	.03	.....	.....	.....
Magnesic Sulphate	.032	.0657	.06	.....	.....	.....
Magnesic Chloride	.071	.....	.....	.081	.0156	.0342
Insoluble Matter	.039	.1295	.12	.063	.0114	.0297
Total	99.965	100.0000	100.00	100.00	100.0640	99.3859

ASHTON FACTORY FILLED SALT.

CONSTITUENTS.	Analysis by Dr. Mott.	Prof. Weber.	Prof. Porter.	Prof. Goersman.	Weltry & Stillwell.
Sodic Chloride	97.596	97.562	97.59	97.65	97.7598
Water	.493	.927	.70	.76	.7880
Calcic Sulphate	1.622	1.315	1.67	1.43	1.2272
Calcic Chloride	.009	.....	.02	.....	.....
Sodic Sulphate	.....	.042	.....	.....	.....
Magnesic Sulphate	.62	.....	.....	.05	.0769
Magnesic Chloride	.76	.112	.02	.06	.0591
Insoluble Matter	.071	.042	.....	.05	.0564
Total	99.959	100.000	10.00	100.00	99.9674

DEAKIN'S FACTORY FILLED SALT.

CONSTITUENTS.	Analysis by Dr. Mott.	Prof. Weber.	Walty and Stillwell.
Sodic Chloride	97.483	97.059	97.4728
Water	.969	.969	.9520
Calcic Sulphate	1.698	1.649	1.4413
Calcic Chloride	.....	.....	.....
Sodic Sulphate	.121	.150	.....
Magnesic Sulphate	.115	.....	.1253
Magnesic Chloride	.093	.114	.0353
Insoluble Matter	.061	.059	.0490
Total	100.052	100.000	100.0757

WORTHINGTON FACTORY-FILLED SALT.

CONSTITUENTS.	Analysis by Dr. Mott.	Walty and Stillwell.
Sodic Chloride	97.462	97.9359
Water	.496	.5120
Calcic Sulphate	1.703	1.2309
Calcic Chloride	.....	.....
Sodic Sulphate	.112	.1076
Magnesic Sulphate	.097	.0431
Magnesic Chloride	.....	.....
Insoluble Matter	.066	.0258
Total	99.936	99.8553

By examining the analyses of salt which I have made as formulated in the first table, it will be observed that Higgins' Factory Filled Salt contains the largest per cent. of pure salt and consequently the smallest per cent. of impurities. The next purest salt is the Onondaga Factory Filled Salt from the Excelsior mills, then comes the "Stader Saline," then "Ashton," then Deakins, and last Worthingtons.

The difference between my analyses of the various salts and the analyses by other chemists, shows that an improvement in the process of manufacture, in some cases, is evident, while in others a slight falling off in the purity of the salt is shown.

The question naturally arises what influence do the impurities in salt have upon butter, if any at all? I think this question has been answered very accurately by Dr. Englehardt, making a comparative calculation from his analysis of Onondaga Salt as given above, and the quantity of impurities that butter would have if salted with this salt. One pound of butter, 16 ounces,

equals 7,000 grains. One ounce of salt used in salting equals 437½ grains. These 437½ grains contain of impurities:

Chloride of magnesium, ...	0.1378 grains.
" of Calcium, ...	0.0739 "
Sulphate of Lime, ...	4.2438 "
Total injurious impurities, ...	4.3555.

The ounce of salt mixed with 16 ounces or 7,000 grains of butter, the impurities in the (16+1) 17 ounces will be, in per cent.,

Chloride of magnesium, . . .	0.00185 per cent.
" of Calcium, ...	0.00099 "
Sulphate of Lime, ...	0.05571 "
Total impurities in 100 of butter, .	0.05855 per cent.

From this calculation it will be seen that not quite $\frac{6}{100}$ of one per cent. of impurities would be present in butter. To assert that this small per centage of impurities would have any neutralizing effect on the mild preservative power of salt would be simply ridiculous. The impurities may have the power of altering the flavor of the salt to a certain degree in its solid condition, or in a concentrated solution of the same, but its effects on the natural flavor of butter would, although in some cases be appreciable to the senses, yet would be very slight. As one drop of a solution of strychnine in a glass of water causes the same to become quite bitter, it shows how powerful some substances are in altering the taste and flavor of a substance. The sulphate of lime in the salt, being a neutral substance, is out of consideration. But chloride of magnesium, sulphate of magnesium and sulphate of soda, especially the first two, have a very bitter taste, and it only requires a small quantity of each of these salts to cause water to have a bitter taste. It therefore is all important for the manufacturers of salt to remove as far as possible these salts, as their presence even, in very small quantities, may slightly injure the flavor of the butter salted.

When butter is properly made, its keeping properties are almost if not equal to butter which is salted.

Too much importance, I think, has been attributed to the salt and the kind used in the preservation of butter, and not sufficient to the carelessness often practiced in its manufacture. As the Hon. L. T. Hawley says: "Poor butter cannot be made good by the use of the purest salt in the world; neither can first-class butter be in any way injured by the use of pure dairy salt in the proper quantity for flavoring it to please the most critical epicure." Let the dairyman, who desires to secure good butter, look first to the health of their cows, the food and water of the cows, and see that they are perfectly free from decompo-

sition or decomposing matter. Then let the teats of the cow be throughly washed with pure water before milking, and not allow the wash water to go into the milk pail. Let the milk be strained and poured through the air to let the animal gases in the milk escape, but the straining must not be done in the barn yard, but as far away and in the purest air as possible. Let him raise the cream by whatever process suits his fancy best, but in a pure atmosphere, and let the churning be done, but not overdone, and let plenty of pure fresh water be used to wash the butter and let it be salted as quick as possible, and properly packed in such suitable receptacles as will keep the air away from the product.

Above all let him be sure and have every receptacle scalded out with pure water, from the milk pail to the butter tub. Butter thus produced is almost, if not entirely, free from those minute organisms which promote its decomposition, and it will possess long keeping qualities.

SECOND EXPERIMENT.

One hundred grains of each salt were dissolved in 500 cubic centimeters of water. The layer of emulsion of foreign substances, which floated on top of the solution, was greatest in the Worthington salt and least in Higgins' salt. The other salt came in the same order as their analyses. The per cent. of sediment found is reported in my analyses showing only .025 per cent. for Higgins' and .071 per cent. for Ashton, these being the two extremes, the other salts coming in between

THIRD EXPERIMENT.

The odor of each solution was examined immediately on solution and after standing—and Higgins' and Onondaga salt gave the strongest pure saline odor. As to the clearness of the solution: all of the salt after standing gave a perfectly clear solution, but the Ashton, Saline, Deakin and Worthington gave immediately on dissolving a clear solution, and Higgins' and Onondaga salt on standing—the latter salt taking a much longer time than Higgins'. The cause of this is very simple. The salts in question are much finer grained salts than the others, consequently the sulphate of lime in them is in a finer condition than in the other salts and being in an anhydrous condition produce a cloud at first, which soon disappears when the sulphate of lime becomes hydrated and dissolved. In the coarse salts some of the sulphate of lime, in consequence of its coarse condition, remains in small gritty particles, which must enter the butter and also remain in that condition.

FOURTH EXPERIMENT.

Each salt was examined carefully under the microscope, but no features of interest was discovered, except in the regularity in the size of the grains of Higgins' and Onondaga salt—the other salts varying very greatly. As to the physical characteristics of the different salts it may be well to state that the Higgins salt was the purest white, next the Saline, Ashton, Deakin and Worthington—the last four having a pure blueish white color, and last the Onondaga salt, which was slightly of a yellowish tinge.

The grain of the Onondaga salt is the finest, next Higgins' and last Saline. There is not much difference in the size of the grain of the other three salts, the Ashton if anything being slightly more uniform than the Deakin or Worthington. Neither of the last three salts have a very uniform grain like the Onondaga and Higgins until sifted.

FIFTH EXPERIMENT.

Each salt was sifted through a 13 mesh sieve and the pan scales separated with the following result:

Name of Salt.	Weight of Siftings.	Per ct. of Siftings.	Weight of Pan Scales.	Weight of Salt Sifted.
				lbs.
Higgins,	None.	None.	None.	448
Onondaga,	1½ oz.	.....	None.	280
Ashton,	5 bags sifted gave 105 lbs.	11.04	½ oz. to 5 bags.	917
Saline,	25 lbs.	12.62	None.	198
Deakins,	18 lbs.	8.07	1 oz.	223
Worthington,	17½ lbs.	7.81	1 oz.	224

From these experiments I think it is conclusively shown that a chemical analysis of a salt which is made with only a very small per centage of salt (.01 per cent.) one hundred of one per cent. at most, in comparison to the quantity of salt in a bag (224 lbs.) not even equal to the percentage of impurities in the salt, although determining what elements enter its composition, is not sufficient to judge a dairy salt by. It does not account for the large percentage of siftings in some salts which put the dairymen to the trouble of reducing the same to a powder before they can be used, neither does it account for the pan scales which although exist in but small quantities in some salts are distributed all through them in fine black specks, here and there, varying in size from a pin's head to one inch in diameter, and in some exceptional cases to six inches. Butter fat has not the property of dissolving salt except to a very infinitesimal extent, what does dissolve the salt is the water present in the butter. It is very certain that if butter is worked and salted, and im

mediately packed and then placed in a cold room, as is often done, the butter hardens and surrounds the particles of salt with an envelope of fat, and the water contained in the butter is not allowed sufficient time to circulate and be brought in contact with the salt, and thereby dissolve it. It, therefore, remains in gritty particles in the butter, which are very objectionable to the taste. The coarser the salt the more liable the butter is to contain these undissolved particles.

It is very evident if the salt is only half dissolved it can only do one-half the work it would do if it were wholly dissolved. This therefore is a powerful argument against coarse salts, and when we consider the large percentage of siftings obtained (all of which should be separated at the place of manufacture instead of imposing the work on dairymen) such as over twelve per cent. in the Saline and over eleven per cent. in the Ashton; and when we consider the pan scales that are left in from not adopting the modern improvements in manufacture, the proper thing for the dairyman is to say to the agents who sell such salts, send your salt back to its place of manufacture, sift it, keep your siftings and pan scales, and we will purchase the rest from you, and then you will have on the market more salts like Higgins' and Onondaga, the only two at present.

There are two other points in favor of pure salt for butter making, the first being that the salt dissolving completely and the solution possessing the power of absorbing odors, the delicate odor of pure sweet butter would be absorbed and retained in the butter. Second, a fine salt is well suited for table use, thus enabling the dairyman to use the same salt on his table, while a coarse salt, like any of the others, is disagreeable for such purposes.

SIXTH EXPERIMENT.

Two experiments were conducted under this head.

First, 80 pounds of cream was churned, and 14½ pounds of butter obtained, this was well washed. Exactly one pound of this product was taken for each salt, and was salted with exactly 1 ounce to the pound. Each pound was made into a print covered with cloth, and 12 hours after being made was placed in a refrigerator; each sample was tested from day to day as regards flavor and odor.

Second, 80 pounds of milk was churned by steam power, and 3½ pounds of butter obtained. Exactly half a pound of this product was taken for each salt, and salted with half an ounce of salt. The product was placed in a refrigerator and constantly examined.

After many careful examinations I came to the conclusion, although my senses are very accute, that it was impossible to

distinguish any particular brand of salt, or to notice any superiority in the preserving qualities of the salts used. I think it is possible for an expert in salt to always be able to distinguish a butter salted with Ashton salt, to one with Higgins', if he is an expert in examining the salt used to spread over the top of the butter; and again, if he detects, in examining two tubs of butter, (one salted with Higgin's and one salted with Ashton,) gritty particles of salt in one tub and none in the other, the one containing the gritty particles he would have to call Ashton, and by this means could distinguish it. That it is impossible to name the salt used in any butter, provided the salt on the cover is not seen, and the salt in the butter is completely dissolved. I have not only demonstrated by my experiments, but I think was most thoroughly demonstrated at the "salt test," which took place in January and April, 1875, a brief synopsis of which I think it advisable to introduce here.

Name of dairy marks and numbers.	Salt used by Dairymen.	Salt named by examiners Jan. 18.	Salt named by same Examiners, April 6.	Salt Named April 7.		
				Windsor.	Duckworth.	Myers.
McAllister..						
No. 1....	Onondaga...	Higgins' ...	Ashton	Higgins' .	Ashton	Higgins'....
" 2 ...	Higgins'....	Onondaga...	Onondaga...	Onondaga...	Onondaga...	Onondaga...
" 3....	....	... .	....	....	....	... .
" 4....	....	....	....	....	... .	....
" 5....	Onondaga...	Onondaga...	Onondaga...	Onondaga...	Onondaga...	Onondaga...
" 6....	Ashton.....	Ashton	Higgins'....	Ashton	Higgins'....	Ashton .....
" 7....	....	... .	....	....	....	....
" 8...	....	....	....	....	....	....
" 9....	Higgins'....	Higgins'....	....	.. ..	... .	....
" 10....	Onondaga...	Onondaga...	....	.. ..	.. ..	....
Blodgett....						
No. 1....	Ashton. .. .	Ashton	Ashton	Ashton	Ashton	Higgins'....
" 2 ...	Onondaga...	Onondaga...	Onondaga ..	Onondaga...	Onondaga...	Onondaga...
" 3....	Higgins'	Higgins'...	Ashton , ...	Higgins'....	Ashton	Higgins'....
" 4....	Ashton. .	Ashton ..	Higgins'....	Onondaga...	Higgins' ...	Ashton .....

Mr. Folsom, the Chairman of the Committee, states in his report: "The result of these tests suggest that some differences are possibly detectable in butter salted with American, and the various foreign salts; but it is evident that the difference is much less marked than has been popularly supposed, and only becomes apparent, after long and very close observation of the form of the grain of the different salts and other minute variations that would be noticed by very few of our most experienced butter men." What does he mean by referring to the "form of the grain?" Surely if the salt is all dissolved in the butter as it should be for a fair test, there would be no form to the grain. Is it possible the butter was tested by examining the "form of the grains" of the salt spread over the top of the butter? This would be no test at all. By referring to the table, it is surprising in two instances how accurately Onondaga salt was detected, but if this was detected by

the form of the grain of the salt, it goes for nothing. Unless the experts who made the above examination can accurately describe how they detected one salt from another in the butter, their work goes for guesswork, and rests purely on luck.

Out of 42 tests, butter salted, Onondaga salt was picked out 11 times correctly, and 11 times incorrectly. Higgins' salt was picked out four times correctly, and 15 times incorrectly. Butter salted with Ashton salt, was picked out nine times correctly, and nine times incorrectly. If such work as this is not purely guesswork, I should like to know what it is. I therefore feel perfectly justified in stating, that if butter be salted with any of the salts I have examined, it is beyond the ability of any expert to name the salt employed in any case other than by purely luck or guesswork.

SEVENTH INVESTIGATION.

The object of this investigation, was to become familiar with the several processes adopted for the manufacture of salt, and to compare, as far as possible, the different prominent features, one with another.

For the description of the processes, I am indebted to various books and patents. The first in the process, adopted for the manufacture of the Onondaga Factory Filled Salt, the second of Higgins', and the last of Ashton.

MANUFACTURE OF ONONDAGA SALT.

The raw salt is made, with the greatest care, by boiling the properly settled brine in half hemispherical kettles, removing during the process of concentration, by a device called panning the separating sulphate of lime, (gypsum) and secondly, the thus manufactured salt, after a proper drainage, is submitted to a most thorough process of washing in machines especially constructed for the purpose, with saturated salt pickle which contains the necessary amount of carbonate soda, (sal soda) for the decomposition of the chlorides of calcium and magnisium, the resultant carbonates of magnesia and lime, and a portion of the gypsum contained in the raw material, run off with the washwater. After a proper drainage on perforated floors, the remaining salt pickle is almost entirely removed. In order to expel the latter, so far as can be done by artificial heat, without injuring the appearance of the salt, it is dried in large revolving cylinders heated from the outside, while a current of hot air is forced through them in the opposite direction in which the salt travels, and which carries off the expelled moisture. To give to the dried salt the requisite degree of fineness, it is ground between stones, and then packed into barrels and bags, in accordance with the requirements of the trade.

MANUFACTURE OF HIGGINS' SALT.

The process by which this salt is manufactured was patented in England, in June, 1877. The salt is manufactured from the brine of a natural brine spring. The brine is brought up from the earth as a perfectly clear, sparkling looking liquid, which is allowed to rest in large reservoirs for some days before being drawn off and evaporated. It is then conveyed into pans where it is subject to a process which precipitates any insoluble matter held in suspension, and is afterwards drawn off into the evaporating pans, where it is heated up to the boiling point. The salt separates from the concentrated solution in fine crystals, which are taken from the pan at intervals and is formed in moulds into conical blocks, in which shape it is passed into hot rooms heated up to fully 180 degrees F., and there it is thoroughly dried. When dry it is reduced from the conical blocks to its original separate crystals, and these are sorted into different sizes, suitable for different uses, every particle of foreign material being removed during the process. The salt is disintegrated by means of a centrifugal machine, and the size of the grain is assorted by a series of sieves all worked by machinery—so that a coarse or fine salt can be obtained of uniform grain. Under each sieve is a sack, bag or pocket, in which the salt falls, and in this form is delivered to the consumer. No handling of the salt is necessary; every part of the operation is conducted by machinery. The passing of the salt through sieves readily explains how the grain is so uniform in Higgins' salt, demonstrating that the grain is the natural size of the crystal and is not produced by grinding or crushing the salt, as has been asserted. It has also been asserted that since Higgins' salt is free from pan scales, the latter must be ground in the salt; by the use of the sieves it will be seen that the pan scales are left on the sieve, the salt only separating out, thus producing a more thorough separation of the scale than any assortment by hand could possibly accomplish. If, though, the pan scales were ground in the salt, chemical analysis would show a much inferior salt, but, on the contrary, the result of an elaborate chemical analysis demonstrates the salt to be the purest salt offered to dairymen.

MANUFACTURE OF ASHTON SALT.

The process of manufacture adopted for Ashton Salt, as described by Francis Moulton, Esq., to you at your last meeting, at Cleveland, is as follows:—"With every care possible used in its manufacture, fully 25 per cent. of the salt is regarded unfit to go into bags; whereas, every other maker sends away the whole product of his boiling pans, be it good or bad. In the manufacture of salt, the purity of the brine is of prime import-

ance. Many of the Cheshire brines contain large quantities of earthy matter, and all of them contain them in a greater or less degree. The Ashton brine is of full strength and freed from gross impurities by passing through two settling pits or reservoirs, before passing into the pans. Before the brine boils, and previous to any salt being formed, any remaining impurities in the brine are removed by a process peculiar to and known only to the manufacturers of Ashton Salt. Some of them are thrown to the surface of the pan and skimmed off, while others are precipitated to the bottom and form what are known as 'pan scales.' When salt is formed in the pans it is not allowed to remain there, but is removed frequently and placed in moulds, and thus uniformity of grain is secured. Any salt not up to the standard is put aside, and the workmen (boilers) suffer by being paid at a lower rate for the salt they have spoiled. The Ashton stoves are unique, and in them the heat is so distributed as to insure an equal temperature. The salt is placed in them and allowed to remain till every particle of the moisture is expelled. Everything done in this department is such as long experience has taught to be most conducive to the proper preparation of salt, and of its being thoroughly dried in every part. When the salt is thoroughly dried in the stoves, it is removed to large rooms, kept at a temperature as hot as will permit of men working. Here every lump is carefully broken *by hand*, and any particles of pan scales or other foreign matter which escaped the notice of the *boilers* or *stovers* are carefully picked out.

"Any lump of salt found not up to the standard is rejected, and only such as are suitable are broken up. The broken salt is then stored in this warm, dry and perfectly clean room, until it is wanted for shipment, when it is carefully *filled by hand*, and the salt being thus again passed in review, any scale that escaped the 'breakers' is picked out. No machinery is used, because any impurity in the lump cannot be detected where machinery is used, as the lump is passed into the machine, crushed, and sacked, the attendant having no opportunity of seeing the condition of the salt. The outside of a lump may appear all right, yet, through carelessness of the boiler, the inside may contain large quantities of pan scales. Should a boiler neglect his pan by allowing it to cease to boil, and then fire up and make it boil, the sudden expansion of the bottom of the pan will detach large quantities of 'pan scales,' which will find their way into the lumps, and their detection is impossible when machinery is used."

The above description of the process of manufacture of Ashton salt, to say the least, is put in pretty favorable terms by Mr. Moulton, and not much credit is given to other processes of manufacture. The process of manufacture adopting "machinery'

spoken of above, I am at a loss to know by whom it is adopted. It certainly does not apply to the machinery employed by the Higgins' process, as no crushing of the salt takes place in any part of the operation.

Mr. Moulton further stated that "the methods of manufacture are handed down from father to son, and thus perfect regularity is secured at a cost considerably over what is paid by other manufacturers. No other manufacturers of salt pay as much for the work done, and consequently none have such a staff of men to whom constant employment at good wages is insured."

With respect to the first statement which may have some poetic sentiment attached to it, has very little practical value to me. This age is an age of progress, and it is the duty of every one to adopt all suitable modern inventions and improvements if they intend in any way to keep pace with the times. A process which depends upon some poetic sentiment of age or of attachment to our dear dead grandmothers, must in time prove a failure.

The statement that pan scales can be more readily separated by hand than by suitable machinery, such as the centerifugal machine and sieves adopted in the Higgins' process, is simply nonsense. It is about as reasonable to expect the miller to separate the brand from flour as completely by hand as by the modern machines constructed especially for that purpose.

The last statement as regards the employment of a large force of men, is nothing but the natural result of refusing to adopt labor-saving machines, to which the United States owes so much of her prosperity. Mr. Moulton further stated that "no manufacturers of salt except Ashton's confine themselves to the manufacture of one discription of salt." It is for this very reason that the size of the grain is so ununiform. If the salt was first passed through a seive before being packed in sacks, there would not be over 11 per cent. of the product in such a coarse condition that dairymen have to grind it before it can be used in their butter.

With reference to process of manufacture of the Onondaga salt, it seems to be founded on good scientific methods, but as the dairymen so frequently complain about the variation in the quality of the salt, which I must say I have noticed in a few samples which I have examined, this opens a serious objection. If however the process, which is more or less a scientific one, is constantly watched, and can be perfected, that is to say regulated so as to produce a uniform product, there is no reason why this salt should not be equal to the best salt in the market.

CONCLUSION.

In conclusion I would state, that by this time, I think from the arguments set forth in this paper, we may safely come to the decision, that a fine grained dairy salt is preferable to a coarse grained salt, and that the purer the salt is the better dairy salt it will make. Now as the Higgins salt is a fine grained salt, and is the purest, that is to say has the smallest per. cent. of impurities in its composition, it is therefore evident that this salt is best adapted for the salting of butter and for household purposes. The other salts will come in the following order: first, Onondaga, next, Saline, then the Ashton, and afterwards the Deakin and Worthington.

GRASSES.

BY PROF. ALBERT H. CHESTER.

If we consult a work in botany we find grasses to be included under the head gramineæ, with more than thirty subdivisions, and including all the grains, as well as maize, sorghum and the like. We will not undertake to discuss all these varieties at this time, but will confine ourselves to only a few of them. But we do not find clover included under the head gramineæ, yet in the popular sense it is as much a grass as any plant. We will, therefore, consider a few of those plants commonly known as grasses, and which are objects of cultivation for feeding stock. The following list includes those that I shall mention as most important, not in scientific order, but just as they happen to come:

Agrostis Vulgaris, or Red Top.
Dactylis Glomerata, or Orchard Grass.
Poa, or Meadow Grass.
Poa Pratensis, or Kentucky Blue Grass.
Festuca Pratensis, or Meadow Fescue.
Anthoxanthum Odoratum, or Sweet Scented Vernal Grass.
Phleum Pratense, or Timothy.
Triticum Repens, or Quack Grass.
Trifolium Pratense, or Medium Red Clover.
Trifolium Pratense Perenne, or Large Red Clover.
Trifolium Repens, or White Clover.

In works on agriculture, particularly the older ones, we find grasses treated as we propose to discuss them here; that is, the name grass is made to include clover, sainfoin and similar forage plants, which have no resemblance at all to grasses proper. They are, however, distinguished by the name *artificial grasses*, while the true ones are called *natural grasses*. A natural grass may be described as follows: "A plant with a narrow, simple leaf, having a flat blade with numerous fine parallel veins, and a long sheath at the base, which represents the leaf stalk, and through which the stem seems to pass." Plants, wanting these peculiarities, cannot properly be called grasses.

It is an interesting fact that the artificial grasses were cultivated first, red clover having been grown in England in the year 1645, and white clover in 1707. Lolium Perenne, called rye grass or darnel, was cultivated in 1677, but none of the

other natural grasses were grown until 1759, when cultivators began the practice of collecting the seed of natural meadow hay, and sowing it along with clover for permanent pastures. In 1766 prizes were offered by the London Agricultural Society for gathering by hand the seed of meadow foxtail, (alopecurus pratensis), meadow fescue and sweet vernal grass. At about the same time timothy was introduced into cultivation. Then the subject began to be thoroughly studied, and after a time a great variety of plants were cultivated, their comparative value being ascertained by carefully conducted, though rather crude, experiments. The process used was devised by the famous Sir Humphrey Davy, and as it is short and simple I will give it in detail and in his own words: "Submit the grass in a green or dry state to the action of hot water until all its soluble parts are taken up. Then separate the liquor from the woody fibre of the grass by means of blotting paper, and evaporate to dryness. The product of solid matter is the nutritive matter of the grass." This method has been used very largely and the comparative value of different grasses for fodder can be easily ascertained by it.

Let us take up now the different grasses in the order in which they were mentioned, but try and get at some of the more important facts with reference to them.

Agrostis vulgaris, or red top, sometimes called also bent grass, is valuable chiefly for pasturage, but does not afford the best kind of hay. It is used generally mixed with other kinds for giving lawns or pastures a permanent sod. It has been found not to succeed well in England, and as far as I can learn is only used there for sandy or barren land that will not raise a better kind. It is, however, recommended as part of the mixture for producing permanent pastures in shady places, such as groves or orchards.

If cut for hay it should be taken when in flower, as by the method of analysis previously mentioned it is found to contain more than twice the amount of nutritive matter then than if cut after the seed has ripened.

Dactylis glomerata, or orchard grass, is called cock's-foot in England, from the fancied resemblance to the foot of the barnyard fowl. It is one of the most valuable grasses for hay or pasturage. It is peculiarly well adapted to shady locations, where it grows luxuriantly. The foliage, though large, is soft, tender and smooth, making excellent hay. Its growth is very rapid, and this adapts it well for pasturage, as when eaten down it comes up again very quickly. It is well adapted then to all uses, except the turf of ornamental grounds, and it should never form part of the mixture for lawn grass, as it grows somewhat in tufts, and also growing more rapidly than the rest, would make the lawn look uneven. Although a native of Europe it

was not cultivated there until 1764, when the seed was carried over from Virginia under the name of orchard grass. It ordinarily grows about three (3) feet in height, but some varieties of it are mentioned which attain a height of twelve (12) or fifteen (15) feet. Even then the leaves are soft and tender, and fit for the food of animals.

Under the general name of *Poa* we have a number of varieties of meadow-grass, the most important of which is *poa pratensis*, our common June grass and the Kentucky blue-grass. *Poa annua* is the most common and universally distributed of all the grasses, and is the weed that springs up so readily in garden or walk. Its leaves constitute valuable forage, but as it dies down every year and only springs up again from the seed, it cannot be relied upon for use. It is quite sure to be just where it is not wanted. But *poa pratensis* is quite a different plant, being perennial, and perhaps better adapted than any other grass for making permanent pastures. Such pastures improve every year, the turf never being broken. The plow is never used on many a dairy farm on all the land used for grazing, and after cropping for years the turf is better than at first. In Ireland they say it requires forty (40) years of pasturing to get the fields into first-rate condition. The turf on the western prairies, which have for ages been grazed by the buffalo and antelope, has grown better and better as years passed along, and there is now no more fertile soil in the world than is to be found there. Look at the corn crops that are produced with no preparation but turning over the sod, and this year after year with no apparent diminution. It has been proved beyond any question that a pasture properly cared for is sure to improve, and the raising of beef cattle is being carried on more and more in the Eastern States. I believe it to be one of the most profitable methods of farming to have the land in permanent pasture, buying as many cattle in the spring as the farm will support, and selling them off again to the butchers in the autumn when they are fatted. And the farm will constantly increase in value, instead of being deteriorated, as is so often the case. By this means nothing is sold off the land but the increased weight of the cattle, which is mostly fat and has been taken from the air. The mineral matter of the soil is all returned to it in the form of manure. In the blue grass regions of Kentucky and Ohio we have perhaps the best pastures of this country. Everything is most favorable to such a result, and the best farms are some that are known to have been in sod for sixty (60) years. Others that were broken, say fifty (50) years ago, and have been reseeded, have never since equaled those that have remained with an undisturbed sod for the whole length of time. An occasional top-dressing of plaster is recommended for such fields, and it might be well also to apply a little phosphate of lime.

Blue-grass seems to thrive best in limestone regions, where the soil is deep, but it will grow anywhere. It is not well adapted for hay as its stems are short any wiry. It should be sowed with clover to get a good set; if not, the hot summer sun is liable to kill it. But it is not ready to cut as soon as clover, so such a mixture should not be used for seeding down meadows. The Kentucky blue-grass is sometimes made a sub-variety called *poa pratensis subcaerulea*, but it is undoubtedly identical with our June-grass. The reason of its greater development in that locality is the depth of soil and climate there. Certain it is that it will not flourish as well in other localities, at least for any length of time. Yet in certain parts of Pennsylvania all that is necessary to get a good sod of it is to prepare the land thoroughly, sow it to some other grass and then leave it. The blue-grass will gradually come in and drive out all the rest.

Festuca, or the various grasses, known commonly under the name of fescue, comes next in order. This grass is one not often cultivated in this country, but it is found in pastures where the land is good, and is one of the most valuable plants either for hay or for permanent pastures. *Festuca pratensis* or meadow fescue is the most common and most valuable. The grass of the English Southdowns is largely composed of *festuca ovina*, called sheep's fescue. *Festuca* is much better known in England than here, for it has there been an object of cultivation for many years. It is highly recommended as part of the mixture for lawns, but formerly it has been difficult to obtain the seed. Within a few years it has become more common and is regularly advertised in the annual catalogues of the seedsmen.

Anthoxanthum odoratum, is the sweet-scented vernal grass, and while it is not very valuable for forage, it should never be left out of the mixture used in seeding down meadow or pasture, for it is this which gives the sweet smell to new mown hay. It is found to some extent in all old sod and lately has become an object of cultivation. It gives an early foliage which is very much relished by cattle, though they reject it later when it is in flower.

Phleum pratense is timothy, or herd's-grass. It is a native of Europe, Northern Asia, and this country. I have often seen it growing wild in the Rocky Mountains, but presume the seed was dropped from the bales of hay carried up to the mining camps. It was first cultivated here under the name of herd's-grass. It was called timothy from having been introduced into the South from this State by a man named Timothy Hanson. It is one of the most valuable of the grasses both for hay and for permanent pastures. In England it is never left out of the mixture used for seeding down permanent pastures. It is one

of the earliest grasses to produce its foliage in the spring, and lasts as long as any. It is generally sowed with clover and gives good crops after the latter has run out. But it is a very exhaustive crop to the soil and needs rich land well and constantly manured. It would not be a very profitable crop except for the high price it commands as hay. When grown with clover one should not wait for it to ripen but should cut it when the clover is ready, for if he waits until the timothy is ripe the clover will have lost much of its value. One writer states that a single head of clover cut the 10th of June gives as much seed as three (3) cut after the 15th. This is in Maryland. Of course the ripening is later here, but it is an undoubted fact that more hay is cut too late than too early. Geo. A. Waring, writing from the Ogden Farm, says he is cutting his hay earlier and earlier, that he takes pains to cut each day only as much as he can handle, and pays very little attention to the weather. Of course where seed is wanted, it should ripen more fully, but there is much loss by rattling out if the clover is allowed to become too ripe. I like to see hay that looks green after it is cured, and I believe it is not only better relished by cattle, but is really more wholesome and nutritious.

This finishes our list of natural grasses, except the too common one *triticum repens*, called couch, quick, and quack-grass. How strange to think that wheat is own cousin to it, being *triticum vulgare*. It is one of the most troublesome weeds we have to deal with, though in some places it is cultivated, being very hardy; indeed nothing but fire will kill it, and it makes fair hay if cut early. If let stand too long it becomes wiry, and cattle refuse it. There is one thing to be said of a farm where it thrives, that it is a sign of good land though of bad farming. It can only be got rid of by the most persistent and determined efforts. Ploughing it up and leaving the roots exposed to a hot August sun will sometimes check it greatly, but actually forking out the roots and burning them is the only thing to be relied upon. It is not safe to try to rot them in the compost heap. They will start up again as soon as given a chance. There are buds less than an inch apart all along the root, or rather underground stem as it is in reality, and each one is ready to send up a new shoot, so the more you break it up, the more new shoots you will get. Unless you take it out altogether you had better leave it alone, for the more you pick at it the better it will thrive. Charles Dudley Warner, in his "Summer in a Garden," gives some laughable accounts of his experiences with it, reminding each of us of similar experiences of our own.

The artificial grasses are quite as valuable as the natural ones, and as we have seen were objects of cultivation at an earlier date. The different varieties of *trifolium* or clover are the

most important, and indeed the only ones much known here, though lucerne is rapidly growing in favor in many parts of the country. The red clover, *trifolium pratense*, and the white *trifolium repens*, are common with us, the first for hay or soiling, and the latter for pasturage. In England they cultivate a variety, *trifolium pratense perenne*, known there as cow-grass, and here as large red clover. Its size is the only thing to distinguish it from the ordinary or medium clover. Its use is principally for soiling cattle, and it is coming rapidly into use among our own farmers for this purpose. Red clover alone does not make the best of hay but when mixed with other grasses it is very valuable. It is probably the best crop we have for soiling and is greatly relished by animals. It ripens early and generally gives a thick aftermath. The greatest value of clover to the farmer, however, is in the ameliorating effect it has on the soil. There is the greatest difference between it and timothy in this respect. Timothy acts only on the very top of the soil taking the good out of it. When the top soil is turned over again for timothy, it gets at more of it and robs that portion, in no case adding anything but always taking out, and from the very top. With clover it is altogether different. The strong woody root goes down, penetrates the sub-soil, bringing up the manure of previous years that has sunk through the top soil and getting out what is good in it for the growth of other plants. So clover enriches soil deepening, and mellowing it, and its roots by decay afterwards act as a manure. It is the best green crop to turn under, on account of its decaying so quickly and because it gives a large amount of plant food to the top soil which it has taken partly from the air, and partly from the sub-soil. It should be ploughed under when it is in flower for the same reason that it should be cut then. It contains at that time the most nutriment, and whether given to the soil for the growth of plants or to animals to nourish them, is then in the best condition for either purpose. If the crop of hay is cut early, and the aftermath ploughed under at the right time, a good yield of grain may reasonably be expected the next year. There is no better preparation for winter wheat or for corn. There is another benefit to the soil in the growth of clover not always thought of. The tops of the plants so shade the ground as to act as a mulch and prevent it from drying up. So clover suffers less that other grasses during a drought. Would it not be better to use our manure on our clover and then plant grain on the clover sod, than as is most frequently the case to give all the manure to the corn and potatoes and let the clover take care of itself? It will take care of itself, and will always benefit the land, particularly if it has a light top dressing of plaster, but it seems to me that we would gain by turning all our attention first to getting a heavy clover

sod and looking for our corn crop afterwards. Clover is at its best for hay the second year after sowing and then is the time to turn it under. If left longer it begins to run out, weeds come in and the soil is not in as good condition for other crops. It should certainly not be left longer than the third year. There is no poorer pasture than one that has been originally seeded down to clover alone. If a clover sod is to be retained for a longer time it must be well manured with "superphosphate" or barnyard manure, and if so treated may be made to yield a good crop the third year and perhaps longer. Geo. E. Waring records his experience where he cut five (5) tons to the acre of first rate clover hay, from a two (2) acre lot so treated. But clover cannot be kept, like other grasses, even by manuring, for it is not a perennial plant but dies out after a few years in any case.

There is a great diversity of opinion as to the best mixture of seed for permanent pastures. There is no doubt about the fact that a greater product is obtained from a given space of ground if it is sowed with quite a number of kinds of seed, than if a single kind or even two or three are sowed. There have been many experiments tried in England and France to decide on the best mixtures for various kinds of seeding, and the results are given in works on agriculture in long tables giving the kinds of seed used in pounds to the acre. The kind of soil, exposure to sun or winds, whether shaded or not, are conditions causing variations in the mixture. I quote one for permanent pastures, taken from Morton's Cyclopædia of Agriculture.

Meadow foxtail,	1 lb.
Sweet-scented vernal grass,	1 "
Orchard grass,	2 "
Hard fescue grass,	3 "
Sheep's fescue,	2 "
Meadow fescue,	4 "
Italian rye-grass,	6 "
English rye-grass,	8 "
Timothy,	1 "
Hudson's Bay grass,	3 "
Rough stalked meadow grass,	3 lbs.
Birds' foot trefoil,	1 "
Large trefoil,	1 "
Sweedish clover,	3 "
Red clover,	2 "
Cow grass,	2 "
White clover,	3 "

In all forty-six (46) pounds made up of seventeen (17) varieties. Many of these are almost unknown and quite unused here, but

I see most of them advertised for sale now in the seed catalogues. It would be a great benefit to our meadows and pastures if these European varieties were more extensively cultivated in this country. Many of them are quite hardy here and would undoubtedly thrive. In favored regions, such as the blue grass country, we have as fine pastures as there are in the world, but the most of our lands do not show anything to equal the old pastures of Great Britain. And though something is due to soil and climate there, there is no doubt that the greater number of varieties of grass grown has its effect as well. Our pastures and meadows are generally seeded down with a mixture of not more than three or four kinds of seed, and often less, and it is only in the expensive mixture used for lawns that we find as many as six or eight varieties introduced, while an English mixture for pastures contains seventeen, as we have seen, and one for lawns has twenty or more, and each one put in for a purpose. The result is an earlier verdure, a thicker sod and a more lasting turf than we are in the habit of seeing here.

SHORT HORNS FOR THE DAIRY.

BY HON. HARRIS LEWIS.

Before the uncertainties of tradition were supplanted by the facts of history, the Durham cow was known, and highly prized in some parts of England for her dairy qualities. In the earlier history of this breed, they were known as the Teeswater, the Holderness, the Yorkshires or Durham, depending upon the location where bred and kept. But, about a century ago, Mr. Turner, of Hurworth, bred the famous bull Hubback, and from him and his descendants, Foljumbe, Bolingbroke, Favorite, and Comet were established the various families of the improved Shorthorn breed of cattle.

Robert and Charles Colling, taking the lead and making selections from the Teeswaters, Yorkshires and Durhams, established the Duchess family of Shorthorns which has been sure to improve every other known breed of cattle with which they have been crossed. The Collings have been followed by Bates, Booth, Spencer, Ducie and others of England, by Morris, Thorn, Sheldon, Alexander, Groom, Wadsworth, Kelley, Harison, Butts, and our near neighbor and friend, Samuel Campbell, and a host of others, until the Shorthorn is well known and duly appreciated in every civilized country of the world.

Although some of the breeders named, and many others, have bred for fancy rather than for the dairy, yet the dairy qualities are inherent in the breed, in an eminent degree, and only require proper management to develop it in its original strength, with absolute certainty.

I might give records of milk, of butter and cheese, of Shorthorns, and their grades, but it will perhaps be sufficient for me to say that the largest yield of milk on record was produced by a grade Shorthorn, and that the second largest was by Duchess 1st, the mother of the Duchess family of Shorthorns.

The largest yield of cheese per cow on record, was produced by a herd of grade Shorthorns, owned by A. L. Fish, Esq., of Herkimer county.

The great value of the Shorthorn over other breeds for the dairy, is in her ability to digest and assimilate the food she consumes more perfectly than any other breed, thereby enabling her, on a given amount of food, to produce the most milk, the most butter, the most cheese, and the most beef for the food consumed, of any breed of cattle we have.

AYRSHIRES FOR THE DAIRY.

BY WILLIAM CROZIER, ESQ.

The few brief lines that I beg leave to submit with references, statistics, &c., to show the supremacy of the "Ayrshires" over all others, are as follows: We are sometimes asked "which is the best of the five different breeds of cattle, the Jersey, Devon, Ayrshire, Shorthorn or Holstein?" Or, as I saw in an extract from the *Country Gentleman*, "which combines the most good qualities for a common farmer?" This depends altogether upon what kind of a common farmer he is. Each breed may be best for its own particular use. But if a person wants a combinative cow I should most emphatically say the "Ayrshire." Very much has been accomplished by our agricultural societies located in different parts of the country, in the way of breeding the very best and most profitable animals for the dairy. Yet very much more remains to be accomplished in this direction. The writings of different ones upon this subject would fill a large volume, part of which, no doubt, would be very interesting as well as useful and instructing; another part amusing, as is always the futile endeavors of the young heads to instruct the older and more experienced heads at the business; and still another part of no use whatever.

The "Ayrshire" cattle, natives of the county of Ayrshire, located in the southwestern section of Scotland, were first known as the "Dunlop" breed. The Highland Society of Agriculturists, which was organized about the year 1720, were the first to recognize the striking qualities of the "Dunlop" or Ayrshire breed of cattle; the first of which was their great value as dairy cattle; next their hardy constitution; again the small quantity of coarse pasture upon which they would thrive.

But it appears that the art or science of successful cattle breeding is, or was, of slow growth; for ninety-seven years subsequent to the organization of the Highland Society in the year 1817, the Duke of Montrose and other landed proprietors of Dumbarton, Sterlingshire and Perth formed themselves into a society for the express purpose of improving the breed of cattle possessing the best qualities for dairy purposes. And again, the "Ayrshires" were chosen by these discriminating judges to meet the demand as best adapted for that purpose.

And as to the statistics of the breed, in those days, the produce of the "Ayrshire" cow bred in Dumbarton was fully equal to that yielded by any of her progenitors, as the following facts will show: For the first three months subsequent to dropping her calf, 30 quarts daily; for the second three months, 24 quarts; for the third quarter, 9, and for six weeks in the last quarter, $4\frac{1}{2}$ quarts. She was then dried, having yielded the year round more than $16\frac{1}{2}$ quarts per day.

And now an extract of statistics taken from the *Country Gentleman*, May, 1871, may be of some value:

	Age.	Weight.	Days in Milk.	Milk in lbs.
Imported Dutch cow, "Dowager,"...	6	1,275	365	1,268½
" " " Crown Princess,	5	1,270	293	9,379½
" " " Fraulein,.....	4	1,225	327	6,980
Imported Ayrshire cow, "Queen of Ayr, ...	4	940	353	9,014
Imported Ayrshire cow, Ozara,.....	5	960	325	7,522
" " " Ops, ...	5	800	326	6,583
Average of three Dutch cows,.....	5	1,256	328	9,680
" " " Ayrshire cows, ...	5	900	334	7,708

It will be observed that the three Dutch cows gave nearly $7\frac{3}{4}$ times their own weight in milk, while the product of the "Ayrshires" was over $8\frac{1}{2}$ times their own weight.

And of another of the same date, which perhaps you may have read, a communication from P. G. Northrup, Delaware county, N. Y., says: "Considerable excitement exists here, in Delaware county, in regarded to blooded stock. Ayrshires and Alderneys each have their defenders. I am selling yearly a large amount of stock at auction, and say that no other cows or heifers sell so readily, or for so large a price as the Ayrshires, and from my experience will *try* to be satisfied with them until I *know* of a better breed."

Thos. Miller made from a four-year-old "Ayrshire" cow he imported, $18\frac{1}{2}$ *pounds of butter in seven days:* from a three-year-old heifer 14 pounds and 12 ounces in seven days. Feed for the four-year-old, grass and three quarts of meal (oats and buckwheat mixed in equal parts) per day; for the three-year-old, grass alone.

And now in regard to generic points of form. After a specific udder has once been obtained the others are so obvious as to be readily added on. The Ayrshire vessel, the knowledge of its perfect type and significations are of primary account to the Ayrshire breeder, who after the good Scotch fashion must ever breed with an eye single to dairy characteristics, regardless of the cry after meat form, however popular it may be.

At a meeting of the Western New York Butter Makers' Association the subject under discussion was the best breed of cattle for the dairy. A. M. Blanchard had kept graded "Dev-

ons" and "Shorthorns;" likes the "Shorthorns" best as *he* gets the most money for them. The "pocket" in all cases being the ultimate criterion, and the best breed for the pocket being the best breed for the dairy. He has been traveling constantly among dairymen for the last ten years, and has always made it a point to visit the milking yards, to examine the milk as drawn from the cows, and has become strongly prepossessed in favor of the Ayrshires as butter producers.

Gentlemen! The cow for the times, the cow that pays the rent, the animal that returns you the largest percentage of interest for your money, the breed that has stood the test in all countries, and under all conditions; the prize winners, the practical dairyman's own cow, the animal that produces the "gilt edged pride of the dairy," is the "Ayrshire." Let me substantiate what I say by allusion to a few that I have known. Take first, "Old Creamer," owned by S. D. Hungerford, of Adams, Jefferson county. This cow was exhibited at New York State Fair in 1873, where she took first prize over all as the best milch cow of any breed; an "Ayrshire," and weighed 1,080 pounds when nine years old, and was claimed to be the champion cow of the world, a broad claim, but it was based upon her merits, when in three days, in the month of June, she gave 302 pounds of milk, or 135 quarts. Her average for the whole of that month was over 94 pounds per day. In eleven days she gave more than her own weight in milk. Take "Flora Temple," 3d, another Ayrshire, our Treasurer her owner, Mr. Joseph F. Brown, of Providence, R. I., for four months, 3,173⅘ quarts of milk; average per day 25⅕ quarts. Weight of milk for four months, 6,745¾ pounds of milk; weight of cow, 1,035. And my own "Belle of Beacon," purchased of Mr. James Finley, of Monkland, Glasgow, Scotland, took five first prizes at the exhibition of the Scotch Agricultural Society, and four first prizes after importing to this country, and her progeny have always taken the highest prizes wherever they have been exhibited and they are scattered all over the country from California to Tennessee.

The excellency and usefulness of a dairy cow, it will be admitted I think, are estimated by the quantity and quality of milk yielded per day, and the quality of the milk by the quantity of butter and cheese it will produce.

Three and a half gallons of milk drawn from the vessel of an Ayrshire cow, and properly manipulated, will yield sufficient cream to produce one pound of butter, and the buttermilk sells readily in our city markets at 3 cents per quart. An Ayrshire cow, therefore, may be deemed a wholly reliable and trustworthy animal, and will yield 257 pounds of butter per annum, besides the value of the buttermilk and her calf. This is high, but well-merited, praise, and can be substantially proven by

good, valid and practical facts in regard to the Ayrshire breed of cattle.

And now thinking that I have taken up full my share of your valuable time, I will, by way of closing my address, give you the points of an "Ayrshire" in a few crude rhymes:

"She is long in her face and fine in the horn,
And will fatten quickly on rations of grass, cake, or corn;
She is clean in her jaws and full in her chine,
Quite heavy in flank and wide in the loin;
She is somewhat broad in her ribs, but long in her rump,
Straight and flat in the back without even a hump;
Wide in the hips and calm in the eyes,
Light in the shoulders, but large in the thighs.
She is long in her neck and small in the tail;
She is beautifully shaped, and good at the pail;
She is fine in the bone, soft and silky of skin,
A grazier without (and when so desired) a butcher within;
Beautiful in color, white, red and brown,
Docile and kind as any to be found.
She is worth for the dairy several acres of ground,
And produces the butter worth a dollar a pound;
She is the queen of the dairy, but puts on no airs;
She is the first to take the gold medal at fairs;
She merits all that is claimed in word, deed or action;
She fills the whole bill, and gives full satisfaction."

THE UNIVERSAL COW.

BY FRANK D. CURTIS, ESQ.

It was that great man, Horace Greeley, whose memory should be revered by farmers everywhere for his interest in their welfare, who said that "an article should be written as though no one knew anything about it." Following his advice, I shall address myself to the Ayrshire Breeders' Association upon topics connected with the breed of cattle in which they are interested, and about which they are doubtless familiar, without any further apology. The origin of this valuable breed of cattle is not clearly stated in history. That they, like many other breeds of animals which are now classed as thoroughbreds, are the result of judicious crossing, seems to be generally admitted. They have been bred for more than a century for a purpose, and that purpose has developed them into a dairy breed of extraordinary merit. They originated in the county of Ayr, Scotland, where they are bred extensively at the present time. The name Ayrshire is derived from their native place. Enterprising men in the districts of Ayrshire, a century and a half ago, sought to improve the cows of the country, as at that time the natives were, according to the historian of the day, "ill fed, ill shaped," and of course diminutive in size, and yielding but a scanty return in milk. In color, they were mostly black, with white lines and white patches about their flanks and heads. Their horns were high and coarse, and the hair coarse and open. Some of their markings and characteristics still crop out in the breed, showing beyond a doubt that these native cattle of Ayrshire were the foundation of the breed. The Ayrshires of the present time have, however, other markings and characteristics, which plainly point to other blood which has been mingled with the original. The buff band around the muzzle, and the band around the eyes, and the pale red, running almost into the fawn, indicate an Alderney cross, for these peculiarities of the Channel blood cattle, I think, are unmistakably evident in many Ayrshire cattle. No doubt the "selection of the fittest," in time, might have improved the Ayrshire cattle and increased the flow of milk, but it would never have changed the ruling colors, and fastened upon them striking resemblances to the modern Jerseys, which show conclusively to my mind, that

Channel Islands bulls were used in Ayrshire to improve the native stock. Why should they not have been? There were enterprising men in those days as well as now. The Channel Islands were not far away, and then as now the charms of poetry and rural life were beautifully blended in Scotland's Burns, as with us in the lamented Bryant. Burns was an admirer of the cows of Ayrshire, and kept them upon his farm. And the titled lords of those days had the ability to import them, and no doubt the inclination for the purpose of increasing the revenues from their estates. Tradition relates how that the Earl of Marchmont, who had estates in Kyle, in Ayrshire, brought to them cattle from the Teeswater, in England, of the ancient Holderness breed, which were the foundation of the improved Shorthorns of the present day. A family of Ayrshire cattle was established by this cross. It also appears from the meager history of that day, that there was still another cross made by a celebrated farmer, a Mr. Dunlop, whose cows, at that time, 1790, were said "to be the best race for yielding milk in Great Britain, or Ireland, not only for large quantities, but also for richness and quality," a trait they have not lost till this day. It is claimed that the Dunlop cross was in part, at least, made by bulls imported from Holland. This is doubtful. The Ayrshire cattle plainly indicate the old Holderness or Shorthorn blood, which is manifest in the inclination to white in color, and the rounded horns, some of them display. The Shorthorns, of a hundred years ago, were milkers, and no doubt this cross upon the Ayrshires improved the size of the latter, and also helped to swell the size of the udder. There was still another cross made by a Mr. Parton with the Kyloe, or West Highland cattle, a breed noted for hardiness, with thick and long coats of hair, and giving a small quantity of exceedingly rich milk. Now and then an Ayrshire is possessed with a coat of hair which is an anomaly, but which it is proper to assume traces back to the West Highland cows of the proprietor of Swinley farm, who thought his Highland crosses an excellent variety. They were shorter in the head and had more breadth between the eyes, and better constitutions. These early crosses will explain to breeders the peculiar features which sometimes crop out and distinguish different cattle and different families in our own herds, among which are long heads and short heads. Another peculiar family, the name of which has escaped me, was established later by a Scottish breeder of Ayrshires, with clipped ears. His cattle were thus marked until they began to be born with the mark, and it finally became a distinctive feature. We had a cow descended from this family of the Prentice importation (Matchless 4th No. 600) which always marked her calves with clipped ears. By the inter-breeding of these different families and crosses the race of Ayrshire cat-

tle was established. No other breed of cattle in the world has been formed just like them. They are a "made-up" breed it is true, but "made up" from the best of the others. The best natives of Scotland have contributed, and then the Channel Islands have added richness of milk, and the Shorthorn size of udder and capacity for a large secretion.

In giving the Shorthorns credit for improving the Ayrshires, in must be borne in mind that this was way back in 1724 and in 1740, at a time when this ancient breed was bred for milk and had a large milk producing value. The modern Short horn is a very different animal, and no one would think of crossing Shorthorns upon Ayrshires to benefit the latter, but a cross of Ayrshires upon the Shorthorns might be wise. A milking Shorthorn is an exception, while one among Ayrshires which is *not* a good milker, is the exception. Quite a difference. The one has been bred up in beef and down in milk, and the other has been bred up in milk and down in beef, but not so much so as it ought to be. We will speak of this afterwards. First, we want to place that magnificent breed of cattle, the Shorthorns, in their legitimate field where they may add millions annually to the wealth of the country. It seems to us folly to urge Shorthorns upon dairymen as a valuable breed for their purposes. Their place is in the stall or on the plains and prairies where God, with bounteous hoard, has stretched the area of plenty far and wide, leaving the few rich bottom lands in the older states for them to be bred upon to supply the demand, for the great beef producing sections of our country. Here and at the breeders' homes, let the frames be made to grow and the quarters be rounded, and the loins thickened, and the beef be piled on until we can produce bullocks in number and quality, so that every out-going steamer shall be freighted with beef which shall tempt the appetites of the old world, and fill their demands to such a degree that our vast plains and prairies and corn-fields shall be utilized to the fullest extent. This is the field I would have the Shorthorns occupy, and it is one worthy of their ambition. Let them follow the way their breeding has led them and leave the dairy for the cattle bred for, and better adapted to it. In placing the Ayrshire as par excellence the universal cow, I must not overlook or do injustice to the rival breeds. The Jersey and Guernsey have their place, and it is near the cream-pot where fancy with gilt edge loves to linger, or upon the lawn where the children of wealth delight to sport. To an amateur dairyman a black tongue, a scrotum tipped with black and solid color are valuable auxiliaries, but a practical dairyman would prefer a twelve quart pail filled with milk. These cattle have a place for usefulness and that is in the butter dairy. They are more delicate than the Ayrshires and require warm stables and gentle care.

The Holsteins are undoubtedly large milk givers as they are large cattle—too large for the average dairyman, as they feed and care for stock, and with the same general management they are in the habit of giving their cows, they will rapidly deteriorate, and I venture the assertion that neither a milking Shorthorn nor a Holstein, will give as much milk on the same feed as an Ayrshire. Then where is the profit in the large breeds for the dairy? Says the advocate of these breeds, "when you want to turn them off for beef they amount to something," "they weigh." It takes feed to make beef, pound for pound, and I am satisfied an Ayrshire will make as much beef and of as good quality; there being less bone in proportion to the beef than in any of the larger breeds. Their beef is not excelled, as I know from actual knowledge. An average Ayrshire cow will dress from 500 to 600 pounds of plump and juicy beef, while a Shorthorn cow must be fed a great deal more and longer to be made to weigh 200 or 400 pounds more, making a difference of only $10 or $20, $12 or $24, according to the price of beef. When dry, such a cow requires one-third more feed to keep her in condition than an Ayrshire, and when milking the same ratio exists with very likely not so much milk. Add this extra cost together for ten or a dozen years, and the extra amount of beef, at the end of her usefulness as a cow, is wiped out, and besides a big debt must be charged to her account. This talk about big cows for their beef product, is the climax of absurdity. A cow is, or should be kept by practical men for her utility. If one breed is more hardy than another in our cold and changing climate, that is an important consideration. I have tested Ayrshires in this respect for years in the same stable with natives with the same feed, and they invariably came out in the spring in the best condition. Large importations of Ayrshire cattle have been made into this country, beginning away back in 1838, by J. P. Cushing, Watertown, Massachusetts; by Daniel Webster, in 1840. The same year Mr. Ward, of Lenox, Massachusetts, made importations of the Swinley family, which I have alluded to as being crossed with the West Highland cattle. These cattle, with others, brought over by Captain Randall, New Bedford, Massachusetts, were purchased by the late E. P. Prentice, of Albany, N. Y. Other importations were made by Mr. Colt, of New Jersey, and by the late William Watson, of Westchester county, N. Y. Senator Campbell, of New York Mills, N. Y., also made early and extensive importations, and so did Mr. Brodie, of Jefferson county, N. Y., and Mr. Hungerford, of the same county. In 1858 and 1859, Mr. H. H. Peters, Southboro, Massachusetts, made extensive importations. Massachusetts has led all other States in the importation of Ayrshire cattle, and the ardent appreciation of older citizens now passed away is main-

tained by others equally devoted. During the past twenty years, a large number of importations have been made in different parts of the country, and many of the original herds have been widely scattered. That of Prentice went mostly to Springfield, Mass., and became the property of Wm. Birnie, being subsequently sold by him to Mr. Stuyvesant, near Poughkeepsie, where they remained a few years, and were then sold to different parties. A portion of the Prentice herd was purchased by Clark J. Hayes, Unadilla, N. Y., and distributed from that point.

The first Ayrshire herd book was issued in America in 1863, under the association of breeders of thoroughbred neat stock, and contained the record of 79 males and 217 females, nearly all owned in New England. Henry A. Dyer, of Brooklyn, Connecticut, was the Secretary. Thus began the history and record of Ayrshire cattle in America. So rapidly has the breed increased in the United States and in Canada, that two herd books are now established, in which there is a record of thousands of animals, and the owners are found in every state and in several territories. There is no essential difference in the herd books, except in one no animals are recorded not tracing to importation, and in the other they are recorded if of undoubted purity of blood, but in a part by themselves and so designated by the Roman characters. The most scrupulous care is maintained to keep the blood pure and the records correct. An Ayrshire herd book has recently been issued in Scotland, superintended by Hon. Mr. Vernon, and contains 446 cows and 117 bulls. It now remains for the breeders to do their part, and there is an enduring future for Ayrshire cattle.

I should not do justice to this occasion if I did not point out what, in my judgment, have been some of the mistakes made by breeders. There has been too much breeding for the gapping crowd, and to fill the eyes of judges at fairs, who often could not tell an Ayrshire from any other breed. Round, smooth, and plump animals always look well and please the eye, but such animals are not the standard for good milkers. We do not want a Shorthorn standard for Ayrshires, but unless I have deceived myself, this has been the model set up in the show ring for Ayrshires, and just so far as it has been done, just so far there has been a departure from the true ideal of an Ayrshire. The result of this striving for the approbation of uneducated judges and untutored people has been to lessen the milking capacity of some herds, and will change the tendency which time has made to produce milk, to an inclination towards flesh which will work mischief. On account of the general pampering of stock for exhibition at fairs, I have often been led to doubt their benefit. They are a damage to the breeder

of milking stock, as the honors are generally competed for. Ayrshires should not thus be pampered, but should be shown as they come from the pastures rough and lean if needs be. They are the people's cattle and the people should be taught to appreciate them in the homely and honest attire of usefulness. Leave the holiday dress for the Shorthorns and Devons. Jersey cattle have been damaged by the fanciful notions of solid colors and black points, and their milking capacity lessened. True merit has given place to fashionable folly too long with this breed of cattle, and there is danger that true merit with Ayrshires will be lost sight of, in aping the Shorthorn standard for smoothness and fuller rounded horns, or in other words, to sum it up, fleshly lust for a handsome contour. The Ayrshire bulls usually selected for the head of the herd are generally the finest in bone and the plumpest in form. This we think is a mistake. This style of selection will breed, it is doubtless true, progeny with smaller horns, which seem to be a night-mare scare to Ayrshire men, forgetting that large horns are natural to the breed, and that the old-time cows wore them with a modest consciousness that other and more important qualities were possessed by them, at the same time, such as larger teats and udder. There seems to be a sympathy in extremes and an effort to get rid of the horns, will also result in lessening the size of the teats. Fineness reduces the extremities, and coarseness enlarges them. A fine horn pleases the fancy, but a small teat is a nuisance, and is the only drawback to Ayrshire cattle. The remedy lies with breeders. Select bulls with moderate coarseness and large development of these same organs, always from a cow with perfect parts. We once condemned a bull to slaughter, because he was too coarse to breed from, although dropped by the best cow. He dressed when a year and a half old 600 pounds. Now we begin to think he was a blessing in disguise, and we did not know enough to appreciate it or him.

Ayrshire calves should never be allowed to suck their dams more than a few days, and they should not be fed to put them in the condition of veals. An over-fed heifer does not make a good cow. They should be kept thrifty and growing, but an excess of fat tends to destroy the development of the milking qualities, and they grow up with lessened capacity for producing milk. A good breed can be soon run out by such management, and fixing up calves for fairs will help rapidly to do it. An Ayrshire calf thus pampered, by me, although it won the second prize at the New York State fair, made a worthless cow, and we have a Jersey cow now, which is another notable example—she, too, having won the second prize from the same society.

Fanciful notions are well enough in their place, but better with amateurs than with professional breeders. A dry Ayr-

shire cow was recently exhibited at a fair as a milch cow, and also as a fat cow. She won both first prizes, and went from the fair grounds to the butcher. In fact she was sold before and the right reserved to keep her until after she had been exhibited. Such exhibitions are a fraud, and such awards a farce. How much can the public learn from such exhibitions? This cow competed with one giving a large flow of milk and a perfect specimen of the breed, but in a somewhat lean condition, showing at a glance her utility. Fat got the award, and this has been too often the case. In 1865 we purchased an Ayrshire bull two years old, brought from Canada. We could not get any authenticated pedigree. His coat was soft and silken, his skin delicate and elastic, and yellow as burnished gold. We liked his looks and bought him. He was on the farm the next year, and a few neighbors had the good sense to bring their cows to him. In the fall we took him to the State fair at Saratoga, but the judges rejected him in the show ring, as we frankly told them we had no authenticated pedigree. A single bull received the entire awards for that year, and my Ayrshire bull went home with so much disgust in the bosom of his owner, that he consigned him to the county house to feed paupers. "The blood of the martyrs is the seed of the Church." My bull proved to be a missionary, and in his death was the means of converting all of the county officials present, and the butcher too, to the value of Ayrshires for *beef*. Such juicy and tender and handsome beef in a three-year-old bull, they had never seen before, nor such a soft and light hide. Every one of the heifer calves of his get turned out to be excellent cows, and one of them, raised and owned by M. B. Callaghan, Esq., is the champion cow of the county. She will make 18 pounds of butter a week, besides supplying the milk and cream used in the family. This cow will give milk the year round. Although only a half blood, she is a model Ayrshire in form. She is open and loosely formed, with a heavy body and capacious stomach. My pure bred Ayrshires, purchased since 1866, have invariably, with two exceptions, been heavy milkers. One of the exceptions was the cow spoiled by overfeeding when a calf, and the other one I think had also been a victim to the same sort of folly. A well bred Ayrshire bull, crossed upon the cows of almost any neighborhood, would improve the stock. This kind of improvement is now within the reach of all, as yearling bulls can be had of the best breeders for $50 to $100. It does not take long to grade up a herd of cows almost to the purity of the thoroughbred. Three crosses will make $\frac{7}{8}$ and 4 will make $\frac{15}{16}$ pure blood. A yearling bull properly fed and handled, will serve 50 cows in the course of the season, without injury to himself. He should not be allowed to cover more than three in any one day, and the time should be divided. The

bull should be kept loose in a box stall out of sight from other cattle, and should be liberally fed. It seems strange to me that dairymen will go from year to year without making one effort to improve their stock. There is a kind of stupidity or wilfulness or want of sound sense about it which I confess I do not understand. Ayrshire cattle are adapted both to the butter and cheese dairy. In their milk is happily blended both the butyraceous qualities and caseous, which fits them for either. Their milk is not so rich as that of the Jerseys, or Guernseys, or perhaps the Devons, but they make this lack more than good by the extra quantity they supply, so that, while the per cent. of cream may be higher in the Channel Island cow, Scotland's pride makes it up in the greater bulk. The milk of an Ayrshire cow in the butter dairy is worth more to the farmer after being skimmed, both in intrinsic value and in quantity, than that of the Jersey, to feed his pigs or to rear his calves, on account of the large per cent. of casein which remains in it. The Jersey has one advantage, imparting a yellower color to the butter. One Jersey in a herd of Ayrshires will remedy this defect and give the butter from the whole herd a richer color. If I should assert that a mixture of Ayrshire and Jersey milk, more Ayrshire than Jersey, will make better butter for general use than clear Jersey milk, I should undoubtedly call down upon my head the wrath of the Jersey breeders, who have taught the public that no butter can be gilt edged except it be made from their favorite breed. When we had more Ayrshires than Jerseys in our herd, the butter was not so hard, easier to spread, easier to work, easier to pack and equally as palatable. Now with more Jerseys than Ayrshires, it is harder to spread, harder to work, harder to pack and no more palatable. It is more yellow and has more grain, and will keep better than any other. One Ayrshire cow has with me given milk enough to feed two calves through the winter and bring them out in the spring in rollicking condition. A Jersey cow could hardly do this. She would want the help of another. In every history of the different breeds of cattle, the Ayrshires are placed ahead as the most profitable and valuable breed for the dairy. The milk of Ayrshires is peculiarly adapted to the wants of young children, especially infants, as it contains a combination of the saccharine, caseous and buttery principles in such proportions as to agree with their feeble digestion, and to render its digestion much easier than that of the Jerseys or other breeds, which contain so much oily matter. On this account Ayrshire milk is more healthy for children's food, as I have demonstrated in my own family. Jersey milk produced colic and other derangements, which ceased as soon as the diet was changed to Ayrshire. We had the same trouble once with a Jersey calf which was sucking its mother, and it would have died had it

not been changed to an Ayrshire cow, which proved to be an effectual remedy. Devon cows give rich milk, ranking next, undoubtedly, to the Channel Island cattle, but their productiveness has been injured in breeding for beauty alone, in which, respect there has been success, as they are, in my judgment the most beautiful cattle in the world. For oxen they are not excelled by any breed, as they are active, kind and handsome. Ayrshires are also well calculated for oxen, as they attain about the right size to be nimble, and at the same time would be heavy enough for a good team. They would make tough workers and be easy to keep in condition, as well as the Devons.

Scotchmen are proverbially economical and thrifty, and waste very little time on chimeras of any sort. They began the creation of Ayrshire cattle for *use*, and they have selected the fittest and bred them for *use*. For more than a century this careful work has been going on. They have been bred for digestive capacity, for vigor and hardiness and energy and capacity in the mammary system. The following points, given by the Ayrshire Agricultural Association, in 1853, "as indicating superior quality," gives an idea of the standard as recognized by leading breeders, in that country: Head short; forehead wide; nose fine, between the muzzle and the eyes: muzzle moderately large; eyes full and lively; horns widely set on, inclining upwards, and curving slightly inwards; neck long and straight from the head to the top of the shoulders, free from loose skin on the underside, fine at its junction with the head, and the muscles systematically enlarging towards the shoulders; shoulders thin at the top; brisket light; the whole forequarter thin in front, and gradually increasing in depth and width backwards; back short and straight; spine well defined, especially at the shoulders; short ribs arched; the body deep at the flanks; and the milk veins well developed; pelvis long, broad and straight; hook (or hip) bones wide apart and not much overlaid with fat; thighs deep and broad; tail long and slender, and set on a level with the back; milk vessel (udder) capacious and extending well forward; hinder part broad and firmly attached to the body, the sole or under surface nearly level. The teats from two to two and a half inches in length, equal in thickness and hanging perpendicularly; their distance apart at the sides should be equal to about one-third the length of the vessel (or udder) and across to about one-half of the breadth; legs short, bones fine, and the joints firm; the colors preferred are brown, or brown and white, the colors being distinctly defined; weight of the animal when fattened about forty imperial stones, that is 560 pounds, sinking the offal.

This standard seems to be more modeled after the Swinley family, which were a cross of the Kyloe, or West Highland, breed, a distinct breed to this day, and native to the Hebrides,

rather than any other. The short head indicates this and the brown color. There are in this country valuable Ayrshires with long heads, long and tapering muzzles, and a preponderance of white in their color, such are undoubtedly the descendants of the Teeswater or Shorthorn cross. The Jerseys are likewise divided by families with long heads and short heads, and still another with dishing faces. A prominent breeder of Ayrshires in this country has suggested to me to urge upon the members of this Association the adoption of some standard of color, in order that the breeding of Ayrshires may be made more uniform. This might be accomplished in time if a special color was agreed upon, but it would take a long time to weed out the markings engrafted in the blood by the different breeds used in the foundation of this breed. The Scotch breeders have not yet made their cattle uniform in color, white and red still being the more common. They were cosmopolite in their origin, and must needs be varied in color. The same breeder also suggests that a desirable form be agreed upon. He says that "breeders generally take for their standard the best cow in their herd. Sometimes this may be a small, compact cow, or it may be a large rangy one. A better understanding in these respects is very desirable, or else conflicting statements and standards will arise. A minute scale of points is too difficult to be fully comprehended by the average mind, but a well defined standard, as regards color and size, with a few general and important points well defined, would be understood and could constantly be kept in mind. We should object to too much smallness of bone, and this would be our greatest criticism to the Scottish standard, as likely to result in delicate extremities, small teats and weakness in vigor and constitution. For the universal cow the latter are essential features, while the small teats must be avoided as constituting at present the greatest objection to Ayrshires. Hardiness is a paramount virtue with productiveness for the dairy districts of New York, and the great competitive regions of the Northwest. Whichever section gives the most prominence to the selection of dairy stock as adapted to their wants will lead in the contest for supremacy. Just as the Ayrshire districts, in Scotland, have distanced all others in Great Britain in the quality and quantity of their dairy productions.

Ayrshire cows are recorded in Scotland as giving a large flow of milk. One dairy of thirty cows gave an average annual yield of 632 gallons, and $9\frac{1}{4}$ quarts of this milk was sufficient to make a pound of butter—amounting to an aggregate of 274 pounds in a year. The average weight of milk of another dairy of six cows was nearly 50 pounds daily. The length of time is not stated. One of these cows gave the year before an average of upwards of 12 quarts of milk per day for a year. Eight

and nine hundred gallons is not an uncommon yield for the year, while thousands of cows, it is authentically stated, yield 600 gallons. This would be 2,400 quarts, nearly twice as much as the average yield from the cows in the dairy districts of New York. A number of Ayrshire cows in this country have equaled the yield in Scotland. It is recorded that Jean Armour, owned by H. H. Peters, Southboro, Mass., gave 49 pounds of milk a pay for 114 days, and that her milk for three days made six pounds of butter. Her live weight at the end of the season was 967 pounds. A cow owned by Mr. Cushing, Massachusetts, gave in one year 3,864 quarts of milk. The Messrs. L. M. & D. Wells, of Wethersfield, Conn., have a large herd of Ayrshires. In answer to an inquiry from us to furnish some account of the yield of milk by their cows they state, we have kept no daily record throughout the season of any of our cows. We have some seasons weighed the milk of the cows, Wednesday and Thursday of each week. This season we weighed the milk about the middle of each week. We know that our cows give over 40lbs. of milk per day each, (they sell the milk;) many of them give 50 lbs per day, and a few of them go as high as 56 to 64 lbs per day. Holly 3d, gave over 10,000 lbs. of milk each year for three years in succession. Myree has this year, since March (when she calved,) given about 12,000 lbs, and is now giving 16 lbs. per day; and is due to calve again March 19. She went dry last year but ten weeks: she has every year for five years, given over 56 lbs. per day during the flush of feed, some days going as high as 64 lbs. The yield of the herd of Mr. J. D. W. French, North Andover, Mass., is a most excellent one. It is given for four years on a herd of 15 cows; the smallest yield of 4,138 pounds is one-third higher than the average yield of dairies of native cows. In 1874, three cows averaged 6,934 pounds; in 1875, eleven cows averaged 6,218 lbs; in 1876, eleven cows averaged 5,310 lbs; and in 1877, thirteen cows averaged 4,932 lbs; the falling off is doubtless owing to younger cows and the effects of breeding. The average for all was 5,572 lbs., or 2,591 quarts. Mr. Libby, of Maine, had three cows which averaged for six years each respectively, 7,649 lbs., 6,553 and 6,683 pounds. The herd of Herbert Merriam, Weston, Mass., seven head, averaged for three years 5,355 lbs, or 2,490 quarts. During the year 1875, they averaged 6,325 pounds. During a record of seven years kept by the Messrs. Sturtevant at South Framingham, Mass., their cows kept for breeding as well as for the dairy, average 2,515 quarts, and in seven other dairies the average is 2,632 quarts, and running up to 3,013. The herd of T. T. Tacker, Penn., eleven head, averaged 5,938 pounds, equal to 2,761 quarts in one year. The average live weight of this herd is 972 pounds. The record of another herd is given as 6,904 lbs. for 1876; and 9,084 lbs. for 1877. The grade Ayr-

shire in the same herd averaged 6,622 lbs in 1876; and 6,602 lbs., in 1877. The herd of Mr. Cornel, Pa., averaged 6,405 lbs. of milk. A dry cow was fatted, and dressed 511 lbs. of beef with 100 lbs of tallow. I find a more specific record of the herd of the brothers Sturtevant, which averaged, including every Ayrshire cow (whether in milk or not) kept on the farm, to be :

1870—2,688 qrts.	1874—2,639 qrts.
1871—2,386 "	1875—1,901 "
1872—2,812 "	1876—2,620 "
1873—2,563 "	

This is understood to be a yield in a region where the pastur age is not naturally luxuriant but short and meagre in comparison to many other sections. These cows were dry, on an aver age each year, only about 42 days. This is about the usual time for Ayrshire cows to run dry, while the natives are supposed to require a rest three times as long. Making a difference of 16 2-3 per cent. in favor of Ayrshires. No breed of cattle, in this country, can equal this grand average of milk yield. Nearly all of these herds are kept for breeding, and this detracts a considerable per cent. from their productive qualities in the dairy. In 1873 the New York State Agricultural Society published statistics which have never been questioned in regard to the average yield of the dairies of the state, of common or native cows. The average yield was 1,300 quarts. The average yield of the best dairies was 1,800 quarts. Ayrshire herds will produce from 2,500 quarts to 3,000 quarts. And grade Ayrshires will excel the natives, or American cattle, from 200 to 500 quarts. Where, then, is the wisdom of sticking to the old rut, and milking cows either at a loss or with a reduced income, when by a small outlay, either grades, or thoroughbreds, may be had, and the profits increased. There is no profit in poor cows.

Let us see what figures may teach us; according to the census of 1875, there were in the state of New York 1,339,810 cows, there having been an increase over the number in 1874, of 27, 931. It may not be uninteresting to state, showing the wonderful strides which the system has made, that the milk of 422,831 cows was sent to cheese factories, and that 41,511,599 gallons of milk were sold in the market. Six hundred and sixty-nine thousands nine hundred and five would be half of the whole number of cows in the state. We will allow that fully this number are used by practical dairymen for the making of butter and cheese, and we will assume that 1,500 quarts of milk are an average (and this is more than than they will do) for each cow. This would make a production of 1,014,859,500 quarts of milk. If these cows were all pure bred Ayrshires, or high grades, no one can fairly question but that they would make an increase of one quarter, or 25 per cent. in the aggre-

gate yield of milk over the cows as returned and rated. This would make an increase of 253,714.375 quarts of milk, which at two cents a quart, amounts to $5,074,285.50. This is an increase in the productive yield of the cows of practical dairymen, which it is easy to obtain. It is an easy matter, comparatively, to breed cattle designed for the shambles,—plenty of feed is the main thing, plenty at the start, and plenty all of the time. With the dairy animal food must be, on the contrary, carefully administered when young, or the courses of nature and the characteristics which have been established by years of painstaking will be changed or destroyed, and a new nature developed. This is proven by the fact that Ayrshire cows with the longest pedigrees of useful parents are the best, and such blood may be depended upon to breed true to type. This fact establishes the value of pedigree, and shows the importance of association and herd books. How can the Ayrshire stock of this country be improved? Many will say, by fresh importations. We disagree with them. We would not import another animal, but rather depend upon what we have. Breeders should be better acquainted with each other's stock, and find out how to make such crosses as will enable them to breed more uniform in form and color. This can best be done by selecting the best stock in this country with long pedigrees, rather than by fresh and strange importations, which breeders are so apt to do. Every new importation starts a new family, when, in my judgment, we have families enough.

If A. has a herd right in color, but lacking in some essential quality, which the herd of B. possesses, then let them exchange blood, with benefit to both. Then, again, if C. possesses a herd of excellent utility, but so finely bred that they lack in teats, let him exchange blood with D., whose herd are coarser formed, and which do not lack in these points. Find animals the nearest like your own, if you have a satisfactory type, which have the points yours lack. This can better be done among our own herds, than by crossing the ocean. There should be a determination among the members of this association to help each other in these efforts after improvement, until there shall be, if possible, but one family, and that one, *perfection*. The owners of a noted herd of Ayrshires, have concluded, in order to perpetuate their best cows, or rather their productive ability at the pail, to pursue line-breeding, inter-breeding. No doubt they will stamp the family characteristics upon the progeny, but they will do it at the expense of hardiness and constitutional vigor. The history of the Duchess family of Shorthorns is the most famous example of successful inter-breeding, but in this notable case, while it resulted in intensifying the blood to such an extent, that a Duchess was sure to improve all other strains, it broke down the procreative functions, and while it made a body

perfect in form, it also made one essentially weak in physical stamina. How far Ayrshire cattle will bear this kind of breeding remains to be seen. If the breeders referred to should succeed in establishing a "*Duchess*" family of Ayrshires, they would be valuable to use in herds with hardy constitutions. I should like to see the experiment tried, but it must be remembered that there is a wide difference between such an experiment and that with Shorthorns, owing to the relative character of the two breeds, and the work required of them. One is an outward perfection; the other an inward, and more difficult. The in-breeding of one family would form more uniform typal characteristics, sooner than the inter-breeding of different families with similar characteristic at the outset, but with the latter, in the end, a more valuable race would be established; because, the important condition of hardiness, which is a synonym for Ayrshire, would not be jeopardized; another thing, the universal dairy cow must be a tough animal, capable of taking care of herself to a large extent. She must not only have a vigorous constitution, but a vigorous appetite, which is perhaps the natural outgrowth of such a constitution, and she must not be bred in any line which will have a tendency to break down this essential quality. This is one reason why I would look more to coarser formed animals, to maintain the real Ayrshire status, rather than to the round, smooth, plump and meaty specimens we have been seeing at all the fairs, which are not the proper types of cattle from which a large yield of milk is expected. They have not got the capacity to create it, nor the place to put it. They may be *handsome* to look at as ideals of symmetry of form, but as ideals of butter and cheese, they are abortions. *Capacity* should be the ideal for the dairy cow. It is contrary to the science and philosophy of breeding to unite in one animal a propensity to lay on flesh, and at the same time possess a large and active and vigorous development of the organs which secrete and contain an abundant supply for milk. The old and familiar law of natural philosophy, that two bodies cannot occupy the same space at the same time, applies here with sensible and effective force. Hence, the absurdity of trying to combine in one animal both of these qualities, with beauty added. It is true that an animal of strongly developed mammalial qualities, will fatten rapidly if dried up, as the active forces, which, in a normal condition make milk, have only to change from the secretion of milk to fat, and milk is fat. In the Shorthorns, no such change can take place, as they lack the glands and vessels for milk, and liberal feeding follows the course of their nature and goes to fat. Possibly with a better education of the real worth and the proper appearance of a genuine dairy cow, breeders will change their practice, and look more to their own actual interests, and the real interests of the

public, and cease pandering to a taste for beauty which fat can make, and thickened muscles, and unite to awaken an admiration for evidences of productiveness. This would be a much higher order of appreciation, for it involves something more than the action of the senses, it embodies intellectual knowledge and discrimination. There is no calling more honorable or useful than that of breeding and improving stock. To be successful in it, there must be devotion to the details and enthusiasm in the results. It is gratifying to know that this valuable breed of cattle are in the hands of men who fully appreciate them, and who have the skill and zeal to carry on the work, and that they will leave nothing undone to make them in this country what they are in Great Britain, the best and most productive breed for the dairy.

SALT IN THE ANIMAL ECONOMY AND AS A FERTILIZER.

BY PROF. FRANCIS E. ENGELHARDT.

The subject assigned to me for to-day, "Salt in the Animal Economy, and as a Fertilizer," is of much greater importance than we are usually aware of, and I shall therefore endeavor to give you a few facts, which will prove both its usefulness and its actual necessity.

The animal organism is formed of three classes of substances :
The nitrogenous (flesh-forming).
The non-nitrogenous (heat-giving).
And the mineral or the salts.

Hence, every perfect food must not only contain these three classes, but what is of greater importance, in their proper porportion, so that it is fit for the perfect support of the body. Since neither the nitrogenous or flesh-forming, nor the non-nitrogenous or heat-giving substances, by themselves, or mixed in any proportions, without containing the mineral constituents, can support life and undergo in the system a proper digestion, as has been proved by numerous experiments on living animals, that died very shortly with such food before them, with all the signs accompanying starvation, they knowing as it seemed instinctively, while suffering at the same time the most intense hunger, the uselessness of partaking any farther of such food. Therefore we must conclude that the mineral constituents of the food are absolutely necessary for the existence of the animal creation.

A few analytical results of the composition of the mineral matter in our domestic animals, their products and in the ordinary foods, may find a proper place here: In 1,000 pounds of live weight of the following domestic animals in fair condition are found, according to Dr. Emil Wolff, the following quantities :

In 1,000 pounds of live weight of the following domestic animals in fair condition are found, according to Dr. Emil Wolff, the following quantities:

— OF —	In the Beef.	In the Sheep.	In the Pig.
Phosphoric Acid	19.2 pounds.	12.9 pounds.	11.0 pounds.
Lime	21.4 "	13.5 "	11.5 "
Magnesia	0.6 "	0.4 "	0.5 "
Potash	1.8 "	1.8 "	1.5 "
Soda	1.4 "	1.5 "	1.0 "
Silica	0.2 "	0.2 "	.....
Sulphuric Acid, Chlorine and Carbonic Acid	3.4 "	2.9 "	1.5 "
Total Ash	48.0 "	33.0 "	27.0 "

And in 1,000 pounds of the following substances have been found:

— OF —	Cow's Milk.	Sheep's Milk.	Beef's Blood.	Calf's Blood.	Sheep's Blood.	Pig's Blood.	Beef.	Veal.	Pork.
Phosphoric Acid	1.7	3.0	0.4	0.6	0.4	0.9	4.3	5.8	4.6
Lime	1.3	2.5	0.1	0.1	0.1	0.1	0.2	0.2	0.8
Magnesia	0.2	0.1	0.1	0.1	0.1	0.1	0.4	0.2	0.5
Potash	1.5	1.8	0.6	0.8	0.5	1.5	5.2	4.1	3.9
Soda	0.6	0.3	3.4	2.9	3.3	2.2	?	1.0	0.5
Silica	0.6	0.2	0.1	2.9	3.3	2.2	0.3	0.1	0.5
Sulphuric Acid	0.6	0.1	0.2	0.1	0.1	0.1	0.4	0.1	0.5
Chlorine, etc.	0.9	0.4	2.6	2.5	3.0	2.2	1.8	0.6	0.1
Total Ash	6.2	8.4	7.5	7.1	7.5	7.1	12.6	12.0	10.4

According to the same authority:

— OF —	Hay.	Green Corn.	Potatoes.	Cabbage.	Straw of Winter Wheat.	Corn Stalks.	Grain of Oats.	Grain of Winter Wheat.	Grain of Summer Barley.	Grain of Rye.	Sugar Beets.	
Phosphoric Acid	4.1	1.3	1.6	1.4	2.2	5.3	6.2	7.9	7.7	8.4	7.5	lbs.
Lime	8.6	1.6	0.3	3.1	2.7	4.0	1.0	0.6	0.6	0.5	10.2	"
Magnesia	3.3	1.4	0.4	0.6	1.1	2.6	1.9	2.0	1.9	2.1	7.3	"
Potash	13.2	4.3	5.7	6.3	6.3	9.6	4.4	5.3	4.5	5.6	11.1	"
Soda	2.3	0.5	0.2	0.9	0.6	6.1	0.6	0.4	0.6	0.3	4.2	"
Silica	13.9	1.7	0.2	0.2	31.2	11.7	12.0	0.4	6.1	0.4	0.8	"
Sulphuric Acid	2.4	0.4	0.6	2.4	1.1	1.2	0.4	0.1	0.4	0.2	2.0	"
Chlorine, etc.	3.7	0.8	0.5	1.1	0.9	1.4	0.5	0.2	0.4	0.4	2.2	"
Total Ash	51.5	12.0	9.4	16.0	46.1	41.9	27.0	16.9	22.2	17.9	45.3	"

Among the mineral constituents of the body, salt is found almost in all its parts, but especially in the liquids; of the latter that which permeates the muscular tissue contains the least quantity of salt. Thus there has been found:

In human blood	.	0.42	per ct.	and	in its ash	57.6	per ct.	of salt.
In human milk	.	0.02	"	"	"	10.0	"	"
In human saliva	.	0.15	"	"	"	62.2	"	"
In human bile	.	0.36	"	"	"	34.4	"	"
In human mucous	.	0.58	"	"	"	70.0	"	"
In human gastric juice		0.13	"	"	"	——	"	"
In human urine	.	0.33	"	"	"	23.0	"	"
In human cartilage		——	"	"	"	8.2	"	"
In human bones	.	0.25	"	"	"	——	"	"
In horse blood	.	0.51	"	"	"	67.1	"	"
In horse ihylus	.	0.53	"	"	"	67.8	"	"
In horse lymph	.	0.41	"	"	"	72.9	"	"
In dog's gastric justice		0.126	"	"	"	42.089	"	"

In the blood of almost all animals the quantity of salt is very constant, usually amounting to over one-half of the total mineral matter, and what may seem very strange indeed, the quantity of salt in the food taken influences very little the quantity in the blood, an excess in the former above that which is required by the system is very soon removed by the kidneys with the urine. The blood of a dog fed during 18 days with meat contained the same amount of salt as it did after feeding him during 20 days with bread.

Of the solid parts of the body the blood corpuscles contain very little salt, while the cartilage has an abundance of it. That the salt occurring in the animal system must have been derived from the food, it is almost unnecessary to state. The following table gives the amount in some of the most common fodder of our domestic animals:

Hay,	. . . . .	0.42½	per cent.
Clover hay,	. . . . .	0.34	" "
Oat straw,	. . . . .	0.12	" "
Beats,	. . . . .	0.09	" "
Clover fresh,	. . . . .	0.08	" "
Beans,	. . . . .	0.07	" "
Peas,	. . . . .	0.04	" "
Oats,	. . . . .	0.031	" "
Turnips,	. . . . .	0.02	" "
Potatoes,	. . . . .	0.02	" "
Rye straw,	. . . . .	0.01	" "
Barley straw,	. . . . .	Trace.	
Rye grains,	. . . . .	"	
Rye straw,	. . . . .	"	
Wheat grains,	. . . . .	"	
Barley grains,	. . . . .	"	
Spring water,	. . . . .	"	

An all-wise Providence has arranged the household of nature so that the animals are almost entirely depending on the plants

for their sustenance. The flesh-forming, fat-producing and heat-giving food materials are entirely derived from the vegetable kingdom, while water, salt and lime (leaving air out of the consideration) are the only three substances that can be directly appropriated from inorganic nature, if not contained in sufficient quantities in the other foods.

The beneficial influence of salt, and as a consequence the desire for a regular supply, has been felt for thousands of years by almost all nations as keenly as hunger or thirst. The use of salt is as old as history itself. A Frenchman, who lived many years among the savages of Brazil and Guiana, says: "That of all the miseries he underwent with these people, none equalled that which resulted from the privation of salt," and the ingenuity of a Bavarian prison warden discovered the fact that the most cruel punishment he could inflict on his prisoners consisted in depriving them of salt in all their food.* Salt is the universal condiment for almost every variety of food, about which there is no dispute, and which our palate peremptorily demands of us. We find it in the hut of the poor added to a meal of potatoes, and on the table in the palace to season the viands af a slave of Epicurus.

The instinctive desire and the natural craving for salt of the brute creation show themselves, especially in that portion that lives on vegetable food. These animals, as is well known, will brave often great dangers and travel many a mile to obtain the necessary salt. It is even asserted that bees will sip a solution fo salt with avidity.

I. The chemical constituents of common salt are: The metal sodium, which in combination with oxygen form caustic soda (soda lye) and if the latter is combined with carbonic acid and water, the well known commercial articles, sal soda and baking soda, and the greenish yellow gas chlorine.

II. *Its medicinal properties*, when administered in small doses, are those of a stimulant upon the organs of digestion, possessing also tonic and vermifuge properties.†

* The late Lord Somerville related that the same punishment was formerly inflicted on prisoners in Holland. They were nourished with bread quite devoid of salt, and this was considered the most severe punishment in that damp climate that could possibly be inflicted, and such criminals were known to be infested with intestinal worms.

† Dr. Marcet, says in regard to salt: "If we consider the average acidity of the gastric juice to be due to the presence of 0.253 per cent. of hydrochloric acid, and if it be addmitted with Bidder and Schmidt that an adult man weighing about 10 stone secretes in 24 hours about 6,400 grammes of gastric juice, then no less than 16 grammes (247 grains) of free hydrochloric acid will be extracted from a human adult's blood, and returned to it in 24 hours. This acid must result from the decomposition of the chloride of sodium (of the blood) as was suggested by Prout, in 1834." "If chloride of sodium be the source of the principal constituents of the gastric juice, hydrochloric acid, this salt must be one of the most important principles of the blood."

Thus Dr. Marshall mentioned a case of a lady, who avoided the use of salt, having a natural dislike for it, that she "was, during the whole of her life a prey to worms." In larger doses from one-half to one ounce it acts as a purgative. When used in foot-bathe it is considered an irritant. The beneficial action of horse-raddish, which grows wild on the sea shore and also often near salt springs, in scorbutic diseases, is mainly due to the large amount of salt. The benefit derived from sea bathing by persons suffering from skin and scrofulous diseases are well known.

III. Chemical and physiological action of the salt in the animal organism. It has been previously stated that the blood of animals contains salt, and that its quantity is a very constant one, which is especially true for each class of animals; it varies among the different classes only within certain limits. Moreover it has been ascertained by numerous investigations, that that portion of the ash of the entire body of any of our domestic animals, which is soluble in water, consists mainly of salts of soda and among them again chloride of sodium or salt occupies the first place. That the animal secretions contain it is proved by the previously quoted analyses. Since, therefore, all the various soda compounds found in the animals must have been derived from their food, and since in the latter the salt is usually a very important ingredient, it follows: That salt at least in part must be a source for these soda componds, and that the animal organism is so constituted that it can decompose salt. As a result of this decomposition we find the one constituent of the salt, namely the chlorine combined with hydrogen as free hydrochloric acid, constantly present, in the gastric juice, assisting in dissolving and assimilating the food, while the other one, the sodium, combined with oxygen to soda, appears in the secretion of the liver, the bile, as glyko-cholate of soda, etc.; the main action of the bile, according to Funke, is to assist in the absorption of fat from the digested material. If we compare the quantity of chloride of sodium or salt, contained in the ash constituents of the vegetable food of our farm stock, with the amount that is found in the ash of their blood, it will strike us, perhaps, as something remarkable that the quantity of salt in the latter, —in the ash of their blood—is always much greater than in the former—the ash of their food—and if we now compare the salt of the ash of their blood with that of the ash of their urine, we find the salt in the latter (the urine) always less, corresponding to the amount of salt in their food. From these facts Leibig draws the conclusion, that there must be a cause or a power acting on the system of the blood vessels, which opposes not only an increase, but also a decrease of the amount of salt in it, and that the salt, therefore, is not an accidental, but a constant constituent of the blood, and that its quantity within certain

limits is unchangeable. Moreover, if we take into consideration the observation made by Bidder and Schmidt, namely, that starving animals soon cease to discharge salt with their urine, but that it is retained by the various liquids and tissues, which contain it in their normal condition with the greatest tenacity, and that the same facts, the retention of salt by the system, has been observed in casses where the formation of cells takes place en mass, as for instance in pneumonia, or in the formation of various exudations from the body, such as pus, ect, the chloride of sodium being required, according to Heller and Redtonbarker, for the formation of the new cells, and finally, that such parts of the body that contain cells in the greatest abundance, for instance the cartilage, are also remarkably rich in salt; we can therefore come to but one conclusion, namely, that salt is absolutely necessary in animal economy. Where, under the above circumstances, none of the salt is eliminated from the body, it must serve for the various functions over and over again, while all the other constituents of the body undergo the normal process of waste.

Again in the blood of the herbiverous animals our horses, cattle, sheep, pigs, the corbonate of soda is found in from two to three times as large a quantity as the carbonate of potash, while their food contains an abundance of potash, but a mere trace of carbonate of soda, thus showing a remarkable preference on the part of the animal system for soda compounds for the blood, to fit it for its functions, while in the muscular tissue and its liquid the potash salts are always predominating for the same reason, hence it follows, though these two substances being so similar in their chemical characters in the process of life, they cannot substitute each other to any extent, their functions in the living body must be entirely different.

But there are yet several other important services which salt renders to the system of our domestic animals. It removes, as I shall show presently, the excess of potash from the system, taken in daily with their food. According to Professor Wolff, there are contained in 1000 parts of the following fodders:

	OF POTASH.	OF SODA.
Hay, ordinary,	13.2 parts,	2.3 parts.
" Timothy	20.4 "	1.5 "
" Red Clover,	18.3 "	1.2 "
" White, "	10.1 "	4.5 "
Meadow grass in bloom,	4.6 "	0.8 "
Timothy grass,	7.4 "	0.5 "
Green oats,	7.5 "	0.6 "
" corn,	4.3 "	0.5 "
Potatoes,	5.7 "	0.2 "
Common beets,	4.1 "	1.2 "
Sugar beets,	3.9 "	0.7 "

Turnips,	3.3	parts.	0.7	parts.
Carrots,	2.8	"	1.7	"
Leaves of common beets.	4.1	"	2.9	"
" " sugar "	6.5	"	2.7	"
" " turnips,	2.8	"	1.1	"
" " carrots,	2.9	"	5.2	"
Bran of wheat,	14.3	"	0.2	"
" " rye,	19.3	"	1.0	"
Brewers' grain,	0.5	"	0.9	"
Straw of winter wheat,	6.3	"	0.6	"
" " summer "	11.0	"	1.0	"
" " barley,	9.4	"	1.7	"
" " oats,	8.9	"	1.2	"
Corn stalks,	9.6	"	6.1	"
Grains of winter wheat,	5.3	"	0.4	"
" " summer "	5.5	"	0.4	"
" " winter barley,	2.6	"	0.7	"
" " summer barley.	4.5	"	0.6	"
" " oats,	4.4	"	0.6	"
" " corn,	3.7	"	0.2	"

A glance at the above table which contains a variety of our most common fodders, convinces us at once, and what has been stated previosuly, that they contain potash, usually from two to ten times more than of soda. Since, now a solution of phosphate of potash and salt, mixed under ordinary circumstances, decompose each other in such a manner, that chloride of potassium and phosphate of soda is formed, we may conclude with great propriety, especially since phosphate of potash is found in the blood, that this decomposition takes place in the blood, and that the same may be especially the case with the organic salts of the food, containing potash. The resultant chloride of potassium is perhaps the main source of this compound for the flesh, and its juice in which it is found in abundance, while its excess together with phosphate of soda is constantly removed by the kidneys to keep the blood in a normal condition.

Bunge, who has made this question a particular study, is of opinion, that the necessity for salt, manifested in the instinctive desire of all herbiverous animals, is due to the great preponderance of potash salts in their fodder, for the removal of which from the system the blood gives up a portion of its salt, hence the necessity of supplying this waste with new quantities to keep up the proper proportion of these two substances in the organism. That a great excess of potash salt in the body without proper means for its removal must be very detrimental to health, it is almost superfluous to state. The dissolving power of salt for casein and albumen in the system, together with the influence it exercises on fibrine, by retarding its coagulation,

are offices of no mean importance in the animal economy; and since we find the nitrogenous substances constantly associated with salt, it is more than probable that it assists in the various changes they undergo. Prof. James F. Johnston remarks, in regard to the necessity of salt for the organism, as follows:

"Upward of half of the saline matter of the blood (57 per cent.) consists of salt, and as this is partly discharged every day through the skin, kidneys, etc., the necessity of a continued supply to the healthy body becomes sufficiently obvious; the bile also contains soda as a special and indispensable constituent, so do all the cartilages of the body; stint the supply of salt, therefore, and neither will the bile be able properly to assist the digestion, nor the cartilage to be built up again as fast as they naturally waste."

Prof. Voit, who made experiments with salt on living animals, to solve the question, if salt introduced in larger quantities into the system produces changes in the conditions of the support of the body and its waste, came to the following conclusions:

"That salt, in consequence of its physical characters, quickens the circulation of the liquids in the body, and thus increases the oxidation of the albumen, and thereby the quantity of urea."

"To remove the salt from the body into the urine, water is necessary; this water passes over into the urine and is taken from the quantity otherwise discharged through the lungs, and if this is insufficient, it is taken from the other organs; therefore, salt is a diuretic."

Dr. Julius Lehmann expresses his views in regard to salt in animal economy about thus:

"Of special importance is salt not only for the entire process of digestion, since it increases the action of all the organs engaged therein, inducing them to discharge saliva, gastric juice, and all other digesting liquids, but also since it serves in the stomach as the material for hydrochloris-acid, which is one of the most powerful means of digestion."

"In the blood, salt is in proportion to the other mineral substances preponderating, and what is remarkable, in almost the same quantity present, if the food taken is rich or poor in it. This retention of constantly even quantities of salt by the blood proves its importance therein. The actions of salt, which, among others, yet to be investigated, consist mainly in keeping the various constituents of the blood in a soluble condition, and also to exchange with other salts present therein, its own constituents, and thus forming certain combinations, which have their particular office to perform in the blood. Moreover, in consequence of its physical character, it introduces into the blood from other parts of the body the required amount

of water, so that the blood remains in its vessels in an easy movable condition.

"Salt is active in a like degree as in digestion, formation of blood and tissues, in the removal of that material that has become useless—for the organism. This action of salt in the animal system is of particular importance in so far as all this waste if it increases and is not quickly enough removed into the urine, will hinder the other useful material in its functions, and thus produce disturbances in the vital process, and in consequence, sickness."

Dr. Plouver concludes from his experiments, that salt mixed in the food in rather larger quantities than is usual, decidedly promotes digestion and the assimilation of nutritive substances, it, moreover, provokes an inercase in muscular strength and so far is capable of counterbalancing the effects of an insufficient nutrition.

Dr. Soelles says in regard to it: "Common salt is almost as indispensable to man and animals as the air they breathe; it facilitates digestion, aids powerfully the oxydation of the blood, and the assimilation, and may be well considered as the digestive auxiliary to the coarser aliments of the poor." He also recommends it against intermittent fever.

The physical property of salt, previously alluded to, deserves more than a passing notice, since thereby, to a great extent, the endosmosis and exosmosis is regulated in the system. If we take a glass tube six inches long and one-quarter inch in diameter, closing one end of it securely with a piece of animal membrane, and fill it about half with water, and thus prepared insert it into a glass filled with the same kind of water, so that the level of the water in both is the same, no change will take place in the stand of the water in both for days, but as soon as we introduce some salt into the water of the tube, the water therein will soon commence to rise above that in the glass. By adding salt in the same proportion to the water in the glass, the level will be the same in both, but by increasing the salt in the glass, the water will pass through the membrane from the tube into the glass, thus lowering the water in the tube. The water without salt passes over to that with salt, contrary to the laws of gravity. Liebig therefore says: "By the mere addition of salt to water, the tube with a membrane becomes a pump; it draws the water through with a force equal to a pressure of a column of from two to three inches mercury," and to continue with him, "if we cover the tube with a very thin membrane and half fill it with defibrinated blood, and put it into a glass vessel with warm water, (100° Farenheit,) the latter will, in a very few minutes, pass over into the blood. If, instead of the blood, we introduce into the tube the liquid, which we may press out of blood coagulated by heat, and which contains

chloride of sodium and the other salts of the blood, we shall witness the same phenomenon; hence, the amount of salt in the blood has much to do with it. The power of the membrane to make the water pass over to that side where the salt is, is therefore depending on the salt. If we add to the salt solution a free alkali (an alkaline carbonate or phosphate), this suction power is materially increased; and if the outer solution is acid, and the salt solution contained in the tube alkaline, the passing over (of the acid to the alkaline,) goes on quickest.

In the animal body all these conditions are united to make the blood vessels with the assistance of the blood to perfect suction pumps, which perform their duty without stop cock and valves. without mechanical pressure, yes, without proper channels for the passage of the liquids. The liquid resulting from the digestion of the food is acid, the blood is salty and alkaline. The entire digestive channel is surrounded by a system of infinitely ramified blood vessels, in which the blood moves with great rapidity; through the urinary organs the excess of water drawn in is at once separated and the blood constantly kept in the proper state of concentration. We can thus readily understand the action of water containing different percentages of salt in the organism.

If, in the morning before partaking of food, we drink every ten minutes a glass of spring water, (say four ounces,) and which contains less salt than the blood, we void a quantity of colored urine already after the second glass, almost equal to the first glass of water, and if we drink in this manner twenty glasses of water we shall pass nineteen times urine, of which that which is voided lastly is almost colorless, and the percentage of salt a trifle larger than that of the water drank.

If we make the same experiment with water to which salt is added in the same proportion as it is about in the blood ($\frac{3}{4}$ to 1 per cent.), none of this abnormal urine discharges will be observed; in fact, it is hardly possible to drink three glasses from this water without a feeling of fullness, pressure and heaviness in the stomach, proving that water which contains an equal quantity of salt as is in the blood, requires a much longer time for its absorbtion into the blood.

If we finally drink some water possessing a greater percentage of salt than the blood, the contrary effect of absorption, namely, purging, takes place.

Thus we see plainly that the power of absorbtion of the blood vessels for water varies, according to the amount of salt. If the amount of salt in the water is smaller than in the blood, it is absorbed with the greater rapidity; if equal, an equilibrium takes place; but if the water contains more salt than is in the blood, it passes not, as the one poor in salt through the kidneys, but through the intestinal canal.

IV. The effect of salt on our domestic animals. The ancients very early recognized the advantages, derived from an addition of salt to the food of their domestic animals. Thus: Jesiah tells us of the eating of salted fodder by the working cattle and asses, and Aristotle relates, that the goats and sheep receive salt in summer to fatten them. Plinius knew of its benefits, since he says: "All live stock is incited to frequent the pastures through the eating of salt, giving more milk and finer cheese." The poet Virgil sings: "He who is a friend of milk and carries the rich clover and lotos, and also salted herbs to the manger, on him smile the swollen udders and the milk shows, though veiled, the action of the salt."

In India the giving of salt to cattle must be very ancient, since Amara Koscha, who lived before Christ, uses a word, the meaning of which is, so much salt as is given to a cow. The Romans, according to Cato, Varro and Columella gave to their flock of sheep every five days salt, about one-half ounce per head. There are some regions of which it is said that the animals must be provided with salt. Thus Warden asserts that in the northern provinces of Brazil the domestic animals die, except salt is given to them from time to time. Roulin has made the observation in Columbia that herds were rapidly reduced in numbers, when an addition of salt to their fodder was neglected, the females becoming barren. The results of Boussingault's experiments prove that the addition of salt to the fodder of cattle, does not increase the flesh or the milk, but that it improves the outer appearance of the animals, they looked more vigorous and healthy, having a smooth skin, while such as were fed with the same food, but without an addition of salt were dull, inactive and sickly, their hair being rugged and here and there entirely wanting. Liebig says in regard to these experiments that they "are highly instructive, for in the bullocks that had no salt, except that which their fodder contained, there was an insufficiency for the process of secretion. For a number of substances, which outside the body would produce disgust, the means of removal were wanting, their entire body, the blood, the flesh and all the liquids were filled with them. The outer skin is the mirror for the condition of the system. The other animals which had received salt daily remained healthy, though in a condition so little in accordance with their mode of life, namely an excess of food and a want of motion. Their blood remained pure and proper for all the objects of sustenance. They received with them a powerful, and under the conditions, an indispensable means of resistance against outside disturbances of their health. The bodies of the others could be compared in regard to sickness similar to a light combustible material to which only a spark was wanting to cause it to burst out into flames and to be consumed."

Ueberacker's experiments with a flock of sheep, living on a low damp pastures, show plainly the beneficial influence and the protection salt renders against sickness. He had a herd of 460 sheep, from which he selected ten, which received no salt, while the rest did. During this year he lost of the 450 head four, but of the ten five, of worms and cachexy or rot. In the following year, of the ten selected, receiving no salt, he lost seven and the other three became a prey to diarrhœa shortly after, while of the rest the 364 that received salt, only five died. The sixteen he selected for the third year's experiments perished all of vermicular pneumonia and cochexy, or rot.

Dr. Phipson relates, that "during one of the worst of these epidemics, which sprang up, if I remember rightly about the year 1840 in the east of Europe, the almost wild cattle of the Ukraine, Podolia and Hungary were struck down in much greater numbers than those of Silesia and Bohemia, where the cattle breeders habitually distribute salt to their beasts."

In the experiments of Farthmann with sheep, the administration of salt increased the live weight; while Sprengel reports a larger yield and a better quality of wool from sheep fed with salt, and a better appetite in the salt fed animals as compared with those that received none.

From Dr. Julius Lehmann's experiments with farm horses it is evident, that the more exercise the horses had the less salt they required. That old horses required more salt than young ones, and finally that it is best to leave the required quantity of salt to the instinct of the animals themselves.

The report of a French Government Commission in regard to the feeding of salt to domestic animals states:

1. That salt ought to be given, to replace the saline parts washed out of the food by boiling, steaming, etc.

2. That it counteracts the ill effects of wet food and meadows to sheep and prevents rot (cachexie) with them.

3. That it increases the flow of saliva and therefore hastens fattening.

4. That in making mixtures of chaff, potatoes, beet, bran, oilcake, etc., salt ought always to be put to it and left to stand for a couple of days to ferment gently.

They recommend per day:

For a working ox or milch cow,	2 onnces
For fattening stall fed oxen,	$2\frac{1}{2}$–$4\frac{1}{2}$ "
For fattening pigs,	1–2 "
For lean sheep,	$\frac{1}{2}$–$\frac{3}{4}$ "
For horses, donkeys and mules,	1 "

Prof. Arnold in his essay "Salt for Animal and Human Use" says in regard to milch-cows: "The percentage of salt in cows' milk is generally greater than the percentage of salt in

her food, and as a large and unnatural flow is induced by a long course of artificial training, her food ordinarily becomes incapable of supplying her with the quantity required to perfect her milk, the flow is diminished and the quality rendered imperfect when salt is withheld from her."

Another authority says:

"Both salt and soda are constant elements in milk, and both have the power of dissolving and holding in solution the cheese matter in milk, when a certain quantity of milk is mixed with salt it will remain in a fluid state, no matter how much rennet may be added and by adding salt to newly, formed curd it will be at once dissolved and appear like milk again as any one may prove on trial. When the flow of milk is largest, the requisite amount of salt (and soda derived from it) is considerable and not being readily derived from the food, needs to be supplied by feeding salt, hence it is that all animals in the season of lactation have a stronger appetite for salt than at other times, and hence also cows that give the most milk consume it most eagerly."

Again, I find it stated, that in a cheese dairy, in the height of the season of lactation, the cows were allowed to go five days without salt, and the result carefully marked. The milk at the end of this time fell off two per cent. in quantity and seven per cent. in quality, making a loss of nine per cent. in the cheese, which was at once restored by supplying salt again. It is the result of repeated observations,—that withholding salt from the cows, diminishes the cheese and makes the whey rily.

Lehmann remarks: "It has been proved by experiment that a greater water consumption (in consequence of feeding salt) increases the milk secretions.

The superior quality of the meat from cattle fed on the marsh meadows near the ocean and moistened by the spray of the waves daily is well known and must be considered mainly due to the salt.

R. Falk, in his most valuable essay on salt says: "Then there is the freedom from disease to which sheep are so liable and which salt seems to prevent. The rot in sheep has often been cured, even in sheep not having had regular salt diet by a dose of strong salt and water; and the complaint called striking, by which so many sheep are annually lost at the time they are turned into clover or other luxuriant green food, is effectually prevented by the use of salt (Walerton); sheep will never stray from enclosures where salt is kept. Lastly we find in Spain, wherever sheep are in the neighborhood of the rock salt hills or sea salt, and have access to it, they thrive best; and in France the same thing is found to exist in the neighborhood of the sea coast, the salt works of the Clarente Inferieure and the mouth

of the Rhone, the sheep giving more and a better wool and the mutton is highly valued all through France, though from comparatively poor pastures."

The practical results obtainable from a proper use of salt in the feeding of domestic animals is stated by Dr. Phipson as follows:

"Our English journals have more than once drawn attention to the fact that a constant supply of salt in moderate doses, hastens the development of the colt and promotes muscular power in the horse, besides rendering this animal less subject to inflammation of the stomach, indigestion, broken wind, worms, periodis flux and phymatosis (water in the legs); preserving oxen from inflammation of the intestines, miteorisation, (acute indigestion), chronic indigestion, phthisis, (consumption) typhus and the formation of egagropiles (calculary formation in the intestines, having for origin a few bristles, hairs or fragments of plants). In sheep experiment has shown us that the habitual use of salt has an extraordinary influence in the prevention of cathexy, (rot, etc) giddiness, worms, phthiriasis (parasites, ect); and in swine it appears to prevent hydatides and some other disorders."

In England, according to him, the average allowance for salt is for

Calves, 6 months old,	1	ounce per day.
Bullock or cow, 1 year old,	3	" "
Oxen, fattening,	6	" "
Milch cow,	4	" "

According to Prof. Goessmann, the results of practical investigation may be summed up in the following statement: "Salt does not increase directly the live weight, yet it favors an economical digestion and of assimilation of the requisite normal amount of food, and it allows us, if desirable, to feed our stock high without incurring a particular corresponding risk. It enables us thus to shorten the time for geting our live stock up to a desirable market value, and assists us, under certain circumstances, to dispose advantageously of a larger proportion of other farm products, as grain, hay, &c., in the form of live weight."

To sum up then, the proper supply of salt makes the animals more lively, strong and capable of resisting disease; their flesh is harder and the functions of the organism more regular. Their digestion is better and they can exist on fodder that otherwise might be injurious to their health (damaged and mouldy food). Moreover with the assistance of salt, they can extract more nourishment from a given quantity of fodder, since the flow of the digestive liquids is more copious; hence it is of special importance with difficult digestible food (rich in starch), since

the latter may readily produce disturbances in the digestive process, and be a cause of sickness. The danger arising from unhealthy food is restrained, and the relaxation of the digestive organs with bad food prevented. The increased thirst is of great advantage with dry fodder. It increases the appetite and makes the food more palatable. (It is a well known fact, that a tasteless food is taken with disgust, and as a consequence, digested with difficulty, however nutritrious it may be). While it does not directly increase the flesh or the milk as some assert, it promotes in a very high degree all the functions of the body, and especially those of the digestive organs.

Time will not permit me to dwell any longer on this part of my subject, but I hope that the few facts which I have presented to you, and which have been taken from the best authors will suffice to establish the truth of my previous assertion, namely: that salt is not only useful, but an actual necessity for the animal organism.

SALT AS A MANURE.

The usefulness of salt, when applied to the soil has been very early recognized by agriculturists, but reliable experiments in this direction date first from the year 1845.

F. Kuhmann, applied in this year to a portion of a meadow, chloride of ammonium, to another of equal size, the same amount of this fertilizer, together with an equal quantity of salt, and a third part remained without manure.

	AMOUNT OF HAY.	
From the unmanured he received	11.263. kilo	Excess over unmanured.
From the one with 200 kilo. chloride of ammonium,	14.964 "	3.700 Kilo.
From the one with 200 kilo chloride of ammonium, and 200 kilo salt	16.950 "	5.687 "

In the next year he made a similar experiment, but employed sulphate of ammonia in place of chloride of ammonium; his results were:

		EXCESS OVER UNMANURED.
From the unmanured	3.323 kilo	
Sulphate of ammonia 200 kilo	5.856 "	2.533 kilo.
Sulphate of ammonia, salt 133 kilo	6.496 "	3.173 "

In the first experiment, therefore, the addition of 200 kilo of salt produced 1,987 kilo more hay, and in the second experiment 640 kilo more hay. During the summer of 1857, the General Committee of the Agricultural Society of Bavaria, had experiments made with ammonia salts, and ammonia salts and salt on barley, &c.

The field used for these experiments had been three years previously manured with stable manure. The first year it had been in rye, the two following in oats. It was divided into 18

equal parcels, four were manured with ammonia salts, one remained unmanured, and four others received the same amount of ammonia salts, and each the same amount of salt.

Lots 1 and 5 were manured with carbonate of ammonia.
Lots 2 and 6 " " " nitrate of Ammonia.
Lots 3 and 7 " " " phosphate of ammonia.
Lots 4 and 8 " " " sulphate of ammonia.

The amount of nitrogen was in each ammonia salt the same.

Lots 5, 6, 7 and 8, received besides the ammonia salts an addition of salt.

	GRAIN.	STRAW.
The unmanured yielded	6.825 grains.	18.375 grains.
1. With carbonate of ammonia	6.335 "	16.205 "
2. " nitrate of ammonia	8.470 "	16.730 "
3. " phosphate of ammonia	7.280 "	17.920 "
4. " sulphate of ammonia	6.912 "	18.287 "

Those that received the ammonia salts and common salt yielded:

5. Salt and carbonate of ammonia	14.550 grains.	27.020 grains.
6. " " nitrate of ammonia	16.510 "	36.645 "
7. " " phosphate of ammonia	9.887 "	24.832 "
8. " " sulphate of ammonia	11.130 "	27.969 "

The excess of those manured with the ammonia salts and salt over those manured only with ammonia salts were therefore:

	GRAIN.	STRAW.
5. Salt and carbonate of ammonia	8.255 grains.	10.815 grains.
6. " " nitrate of ammonia	7.770 "	19.915 "
7. " " phosphorate of ammonia	2.607 "	6.912 "
8. " " sulphate of ammonia	4.218 "	9.782 "

From three other lots of the same size, of which one was manured with nitrate of soda, (chili saltpeter) the other with chili saltpeter and the same quantity of salt, which had been used for the others, and the third with guano, which contained the same amount of nitrogen as the ammonia salts employed, the result were:

	GRAIN.	STRAW.
With chili saltpeter	12.320 grains.	32.480 grains.
" " " and salt	17.920 "	35.780 "
" guano	17.200 "	33.320 "

In 1858 these experiments were repeated with winter wheat, on a field that had been six years previously manured with stable manure. It had been first in rye, then clover, and for the last three year, in oats.

	WINTER WHEAT.	
	GRAIN.	STRAW.
The parcel manured with guano produced	32.986 grains.	79.160 grains.
With sulphate of ammonia	19.600 "	41.440 "
" phosphate of ammonia	21.520 "	38.940 "
" carbonate of ammonia	25.040 "	57.860 "
" nitrate of ammonia	27.090 "	65.100 "
Unmanured	18.100 "	32.986 "
With salt and sulphate of ammonia	29.904 "	61.040 "
" " " phosphate of "	31.696 "	71.960 "
" " " carbonate " "	31.416 "	74.984 "
" " " nitrate " "	34.832 "	74.684 "

Showing again a larger yield where salt was used in conjunction with the ammonia salts.

I might quote a great number of experiments in which similar results were obtained, others in which salt had no influence on the crops, and others where it actually proved injurious, (having been employed in too large doses). Moreover, we know from numerous analyses of plants and soils, that the latter usually contains sufficient salt or soda compound to supply the required demand of the former: since, with the exception of the sea shore plants, the potash salts are largely preponderating over the soda salts in the vegetable creation, as stated previously; hence, we must conclude that the beneficial results obtained with salt, must be due, in a great measure, to its indirect action.

Professor Girardin found by experiment, that in a soil containing 5 per cent. of salt, only sea shore plants—salt plants—will grow; and when it contains 12 to 14 per cent. even these can not exist.

This indirect action of salt depends, in a great measure, on its power when in solution in water, to dissolve substances that are either entirely insoluable in this medium, or only to a very limited extent.

Water containing carbonic acid, ammonia salts, chili saltpeter or *salt*, is capable of dissolving the phosphates of lime and magnesia and distributing them through the soil, thus making them available to the roots as plant food. Salt possesses this power to a very high degree, even when only present in very small quantities, as has been determined by direct experiments. In the same manner it has been ascertained that avery diluted solution of salt, when coming in contact with a soil which possesses phosphates of lime and magnesia in excss, it will absorb phosphoric acid and when coming in contact with a portion of soil that is not saturated with phosphoric acid, it will give up to the latter the previously absorbed quantity.

A solution of salt in water (0.2 per cent). passing through an equal volume of earth, will give up one quarter of its salts to the earth. Therefore, says Liebig, "if a soil is manured with nitrate of soda or salt, and they have formed weak solutions with the rainwater, which passes into the soil, a large portion of these salts remain unchange therein, and they must have in the moist soil a weak, but by its constancy, a powerful action."

And again he says in another place thus: "The heaviest manuring with the phosphatic earths (lime and magnesia) in coarse powder, can hardly be compared in its action with a much lighter one, the particles of which are in a state of infinate subdivision, and in consequence of which it becomes thoroughly distributed throughout all parts of the soil. One single rootlet requires from the place where it is situated in the soil, very little nourishment; but for its function and its ex-

istence, it is indispensable that this minimum is precisely in this place; if the plant food does not dissolve in water, there is no excess for the sustaining functions of the root in other places. The salts previously named, possess now the property, to remove plant food from the place where there is an excess of it, to others where it is wanting, and if the elements of these salts take no part in the sustaining process, they must, nevertheless, influence the increase in the crops to a considerable degree."

"When the sulphate of ammonia and the chili-saltpeter have entirely become transformed into lime and magnesia salts, (into chloride of calcium and chloride of magnesium, their action ceases entirely; hence, a new application of them is required to produce their action a second time."

"Thus, it is clear, that by a proper application of the chemical action of salt, chili-saltpeter and ammonia salts, the agriculturist can supply and supplant the mechanical work of the plow and the action of the atmosphere during the fallow-time."

We can, therefore, compare the action of salt on a soil rich in phosphates, with that of the sulphuric acid on bones or mineral phosphates, it makes them available as plant food, by dissolving and distributing them in the soil, and for this object there are no cheaper and better means at our disposal than refuse salt from our salines.

The power of the soil to absorb moisture from the atmosphere, is largely increased, as has been proved by experiments, by the addition of salt. It is destructive to caterpillars, snails, animalculæ fungi, hence, its use for pickeling wheat and against dry rot.

The addition of salt to the manure heap, as practiced occasionally, should find a wider application, and the same may be said in regard to compost heaps. Its application in combination with artificial manures, has been recommended especially for fruit trees and ornamental shrubs.

Thus, gentlemen, I have, in the time allowed me, endeavored to present you with such facts and opinions as I hope will convince you of the great importance salt bears, both to the animal, economy and in the soil, and which is certainly equal to that which it bears to the dairy, the packing of provisions, and to the arts and manufactures.

LESSONS OF THE CENSUS.

BY J. V. H. SCOVILL.

The great staple productions of the United States are wheat, corn, cotton, hay, tobacco, and lastly, though not least in importance, dairy products. "Cotton is King" is an old axiomatic saying, which we of this day and generation hardly expected to see controverted, but we have lived to see it occupying a secondary place among our great industries, and the dairy, which for so long a period occupied a back seat, now comes forward and claims prëeminence, because the present cash value of the productions of our dairies is greater by one-seventh than the wheat crop, and greater by one-third than the cotton crop of the United States, the estimated value reaching the enormous sum of $350,000,000. A careful survey of the great producing regions of our country reveals the fact that each of these great commodities has some favored spot over all others where the production is as it were spontaneous, and where each attains its greatest perfection by reason of the special adaptability of the climate and the soil.

It is a remarkable fact in nature that each has its natural place of production distinctly marked. Thus the present most available producing region for the cotton plant, where it attains its greatest perfection and most luxuriant growth, is a belt of land skirting the Mississippi river on both sides, commencing at the southern boundary line of the State of Tennessee, including portions of the States of Arkansas, Mississippi and Louisiana, a belt of land apparently about 200 miles in length by eighty in width—the almost exact duplicate of the great central dairy belt of the State of New York, extending from the St. Lawrence river on the north to the boundary line of Pennsylvania on the south. New York has her wheat fields distinctly marked. The natural productions of the Genesee Valley and the hills of Norway and Poland, in Herkimer county, have no greater similarity than a black sheep and a white one, but each are alike important in the great economy of nature. Time was when the Genesee Valley furnished the largest proportion of the flour consumed on the Atlantic coast, of a quality which was considered without a rival in the markets of the world, but where now would we turn our eyes would we discover the area

of greatest productiveness; we see it on the Pacific slope, and if we look for it on the east of the Rocky Mountains we find it in the comparatively new States of Minnesota and Iowa. In Southern Minnesota and Central Iowa is located that narrow belt of land whose fruitfulness as a wheat producing region is not excelled considering its area, and it is from the wheat here grown that our millers seek to get their supplies, and mix it with other kinds, and thus produce the most delicate flour now so popular in our markets.

Would we look for the corn fields? We find Southern Ohio, Central Illinois, Western Iowa and portions of Kansas taking the lead in this industry, and these greatest of corn producing centres are as entirely distinct from the wheat fields and the cotton fields as are the dairy pastures.

Although tobacco is grown over large sections of our country, yet it is cultivated most extensively and attains its greatest perfection in a small portion of Western Kentucky and on the western shore of Maryland.

New York is preëminently the dairy State, and I believe that it bears the same relation to the great dairy industry of the United States that Mississippi bears to the cotton crop, Illinois to the corn crop, Minnesota to the wheat, and Maryland or Kentucky to the tobacco crop.

In order to more intelligently illustrate this subject I have prepared these maps representing the States of Vermont, New York, Pennsylvania and Ohio, because of their being the most extensive dairy producing districts of our country. Each State is divided by county lines, and each county is measured according to its relative merits and painted a corresponding color. The basis of this figuring is the number of acres of improved land in each county and the entire milk production both butter, cheese and milk sold, reduced to cheese product. In this arrangement four colors are employed, the green represents the first class dairying counties, or those where one cow is kept on an average of from five to ten acres of improved land. The yellow represents those counties which I denominate as second class, or those where one cow is kept on an average of from ten to fifteen acres of improved land, and these I denominate our dairying lands, and in the main argument these two classes are united together. The remainder are classified as non-dairying, the carmine representing those where one cow is kept on an average of fifteen acres and over, and the orange color those where the proportion is twenty acres and over, to each cow. Where the *per capita* production has fallen very much, (fifty pounds,) such counties have generally been classified as non-dairying.

I append the tables for reference in lieu of the maps and repeat that it will be understood that the number of acres upon

which the computation is based is the number of acres of improved land in each county. The basis of product in the second and third columns is the entire milk production as reported in the census of 1870, the production of butter being reduced to that of cheese, by allowing two and one-half pounds of cheese to one of butter, and the number of gallons of milk sold were also reduced to cheese product, and all were added together.

DAIRYING COUNTIES.	No. of acres of improved land to each cow.	Total milk production in cheese.	
		Cheese products in pounds per acre.	Pounds of cheese per capita.
Broome	9.9	31	191
Cattarangus	8.1	37	356
Chautauqua	9.0	34	291
Chenango	7.8	42	453
Cortland	7.0	49	487
Delaware	9.8	34	393
Herkimer	6.1	57	496
Jefferson	7.5	38	388
Lewis	7.2	44	443
Madison	8.5	40	318
Montgomery	7.9	40½	284
Oneida	7.6	39	231
Orange	6.9	48	218
Oswego	9.0	33	168
Otsego	9.8	30	293
Putnam	8.9	39	275
St. Lawrence	7.6	36	364

SECOND CLASS DAIRYING COUNTIES.	No. of acres improved to each cow.	Total milk production in cheese.	
		Cheese products in pounds per acre.	Pounds of cheese per capita.
Allegany	12.7	22	207
Chemung	11.8	23	108
Dutchess	13.8	19	115
Erie	10.5	27	98
Franklin	11.2	22	180
Fulton	13.5	20	123
Onondaga	12.2	25½	114
Schoharie	11.9	21	177
Sullivan	11.1	20	116
Tioga	11.2	27	176
Tompkins	13.5	24	174
Westchester	10.2	26	49
Wyoming	11.6	25	282

NON-DAIRYING COUNTIES.	No. of acres improved to each cow.	Total milk production in cheese.	
		Cheese products in pounds per acre.	Pounds of cheese per capita.
Cayuga	15.6	18	125
Greene	15.6	17	134
Rennsselaer	17.9	14	59
Saratoga	19.8	13	90
Schenectady	16.7	15	88
Schuyler	19.1	15	122
Steuben	15.7	16	124
Ulster	15.8	15	60
Washington	19.20	14	117
Wayne	17.5	15	109

SECOND CLASS NON-DAIRYING COUNTIES.	No. of acres improved to each cow.	Total milk production in cheese.	
		Cheese products in pounds per acre.	Pounds of cheese per capita.
Albany	19.9	14	36
Clinton	20.5	11	71
Columbia	22.3	11	81
Essex	29.4	11	104
Genesee	22.1	11	99
Kings	9.6	36	1½
Livingston	26.3	9	88
Monroe	21.6	13	55
Niagara	21.5	15	101
Ontario	27.3	10	88
Orleans	24.4	11	86
Queens	13.	19	39
Richmond	14.1	11	5
Rockland	13.7	17	27
Seneca	23.6	12½	87
Suffolk	14.2	11	35
Warren	21.3	11	69
Yates	24.8	11	97

VERMONT DAIRYING COUNTIES.	No. of acres of improved land to each cow.	Cheese products in pounds per acre.	Pounds of cheese per capita.
Chittenden	9.9	32	196
Franklin	10.	29	270
SECOND CLASS.			
Lamoille	12.	23	208
Orleans	14.	22	210
Washington	13.	14	138
THIRD CLASS NON-DAIRYING COUNTIES.			
Addison	17.	18	221
Rutland	15.3	17	125
SECOND CLASS NON-DAIRYING.			
Bennington	22.	12	71
Caledonia	22.	13	141
Grand Isle	25.	11	101
Windsor	28.	7	80

PENNSYLVANIA DAIRYING COUNTIES.	No. of acres of improved land to each cow.	Cheese products in pounds per acre.	Pounds of cheese per capita.
Crawford	9.5	19	98
Delaware	7.	46	105
Montgomery	8.	42	132
Wayne	9.9	24	80
SECOND CLASS DAIRYING COUNTIES.			
Berks	12.	18	62
Bradford	10.4	26	175
Bucks	11.	25	126
Chester	11.	22	106
Cambria	14.	11	29
Elk	12.	17	32
Erie	13.	18	71
Lancaster	14.	13	48
McKean	13.	18	60
Pike	12.	15	47
Potter	13.	21	106
Sullivan	13.	15	92
Susquehanna	11.	22	171
Tioga	11.	23	123
Warren	11.	22	80
NON-DAIRYING COUNTIES.			
Adams	19.	11	79
Allegany	16.	13	14
Armstrong	19.	6	33
Butler	17.	15	99
Cameron	17.	20	30
Carbon	19.	8	8
Clinton	19.	10	24
Dauphin	16.	5	17
Forest	17.	17	45
Jefferson	19.	11	57
Lawrence	19.	12	66
Lebanon	15.	10	42
Lehigh	15.	13	43
Luzerne	15.	14	17
Mercer	16.	15	81
Northampton	15.	13	37
Somerset	18.	13	119
Union	19.	8	43
Venango	18.	13	31
Wyoming	15.	13	77
York	17.	11	59

NOTE.—The remaining counties of the State, whose proportion is above 20 acres to each cow, are not tabulated.

OHIO DAIRYING COUNTIES.	No. of Acres of Improved Land to each cow.	Cheese Product, Pounds, Per Acre.	Pounds of Cheese, Per Capita.
Geauga	9.7	30	387
SECOND CLASS.			
Ashtabula	13	19	165
Henry	14	13	53
Hamilton	12.7	27	16
Lorrain	10.6	22	165
Lucas	14.8	14	19
Medina	12.4	16	164
Ottawa	14.9	12	37
Paulding	14.1	14	39
Portage	12.1	22	186
Putnam	14.8	10½	48
Cuyahoga	12.6	20	30
Summit	13	24	23
Trumbull	12	23	150
NON-DAIRYING COUNTIES.			
Ashland	18	12	105
Auglaize	18	7	31
Defiance	16	11	58
Fulton	15	16	85
Huron	19	11	80
Lake	19	13	88
Mercer	19	8	53
Wayne	19	11	81
Williams	19	11	70
Wood	17	12	57

NOTE.—The remaining counties of the State, whose proportion is twenty acres and upwards to each cow, are not tabulated.

Thus it will be seen that the great dairying district of the State of New York, and I believe I may be justified in saying the greatest dairying region of like extent in the world, comprises a narrow belt of land scarcely more than 80 miles in width, bordering on the St. Lawrence river on the north, with the counties of Jefferson and St. Lawrence, and extending southward through the center of the State to the boundary line of Pennsylvania. Comprised in this area are thirteen counties lying in a solid body, together with the counties of Putnam and Orange on either side of the North river, and the counties of Chautauqua and Cattaraugus in the southwestern portion of the State. Embraced within these seventeen counties is nearly two-fifths of the arable land of the State, comprising 6,055,665 acres of improved land against 9,576,760 in the remaining counties of the State. Grazing upon those pastures are 751,260 cows—more than one-half of the number kept in the entire State. The counties of Orange and Putnam are essentially milk producing, the remaining fifteen counties being butter and cheese producing, with not a small proportion of milk sold for local consumption, etc. The annual product of the dairies

within this district, in 1870, foots up as follows: 56,561,601 pounds of butter, 18,154,819 pounds of cheese, and 96,834,616 gallons of milk sold. These figures indicate that there is produced within this area more than one-half the butter, nearly four-fifths of all the cheese, and more than two-thirds of all the gallons of milk sold, which are the products of the 751,260 cows noted above.

From the tables it will be observed that Vermont has two counties in the corresponding classes, Pennsylvania four, and Ohio one, Geauga; and the combined acreage of improved land in these counties is 1,463,903 acres, or about one-fourth of the corresponding area in the State of New York. The number of cows kept in these counties is 157,527, or a little less than a fifth of the number in New York in corresponding classes.

Chittenden county, Vermont, is almost the exact duplicate of Broome county, New York, having one cow to every 9.9 tenths acres, a per acreage product of 32 pounds, and a per capita production of 196 pounds. Franklin county has one cow to every ten acres, a smaller per acreage production than Chittenden of three pounds, but a per capita product of 270 pounds. The county of Windsor is but little devoted to the dairy as is evident from the fact that it has one cow to every 28 acres, a per acreage product of seven pounds, but a per capita production of 80 pounds.

Wayne county, Pennsylvania, is the duplicate of Broome county, which it joins at the southeast corner, having one cow to every 9.9 acres—a per capita production of 80 pounds only. Crawford county, which is the great cheese county of the State, has one cow to every 9½ acres, and turns out a per capita production of 98 pounds, the same as Erie county, New York.

Delaware and Montgomery counties attain their significance as milk producing counties from the great consuming city of Philadelphia.

Geauga county, Ohio, has one cow to every 9.7 acres, a per acreage product of 30 pounds, and a per capita production of 387 pounds, the same as Jefferson county, New York. Let the representative county in each one of these States be taken for comparison thus:

Herkimer county has 48,547 cows and 296,629 acres improved land, and one cow to 6.1 acres, but to make the comparison more liberal take the proportion as indicated in the census of 1875, 6.7 acres to each cow, and what is the result:

Chittenden county, Vermont, has 21,941 cows and 218,670 acres improved, which makes the ratio 9.9 acres to each cow.

Crawford county, Pennsylvania, has 34,247 cows and 328,555 acres improved land, which makes the ratio 9½ acres to each cow.

Geauga county, Ohio, has 18,674 cows, and 182,650 acres improved land, which makes the ratio 9.7 acres to each cow. To bring up the proportion of Chittenden county to the standard of Herkimer would require an increase in the number of cows of 10,547. To bring Crawford county to the same standard of Herkimer would demand the number of cows to be increased 14,791. To bring Geauga to the standard of Herkimer would require an increase of 8,587 cows. This comparison shows that Herkimer has more than one-third more cows on the same proportionate area than the other counties named.

Recurring again to the State of New York and to the tables, it will be observed that Herkimer county is the most extensive dairying county in the State, having one cow to every 6.1 acres. The average production is 57 pounds, and the per capita production 496 pounds. The counties next in the list are Orange and Cortlandt, and then follow Oneida and St. Lawrence, with three pounds variation in the per average product in favor of the latter, and a per capita production also of 33 pounds, while each have one cow to every 7.6 acres. In the table of the second class dairying counties, the county most largely devoted to milk production is Erie, having one cow upon an average of every 10½ acres, a per acreage product of 27 pounds, and a per capita production of 98 pounds, affected in undue proportion by the large non-producing population of the city of Buffalo. The same facts are also more vividly presented in Westchester county, but it must be borne in mind that Westchester is a milk producing county, where the system of soiling is largely practiced, and the cows fed on concentrated foods. Chemung county has one cow to every 11.8 acres, and I deem it no disparagement to this or any other county to claim that it is not so largely devoted to dairying as Herkimer. Chemung, with about half the number of acres of improved land, produced, in 1870, of both winter and spring wheat, 162,434 bushels, Herkimer county only 10,665 bushels, and Oneida but 68,342, while St. Lawrence produced of spring wheat more than 250,000 bushels. In the last table of those counties named as non-dairying, the greatest proportion is reached with Essex, which has only one cow to nearly an average of 30 acres, Ontario something over 27 acres, and Livingston nearly the same. When I adopt as the conclusion that five-sixths of all the land in Herkimer county is devoted to the dairy, and something less than five-eighths in the counties of Oneida and St. Lawrence, and in the proportion of about one-quarter in the county of Monroe, I would not be understood as speaking disparagingly of this or other counties, for the 1,050,448 bushels of wheat from Monroe freely attest the productiveness of her soil. I am not prepared to say that Genesee, Monroe, Livingston, or Orleans, counties cannot as a whole produce as fine a dairy pro-

duct as Chautauqua, Herkimer, Chenango or St. Lawrence counties; but one fact is demonstrated that the central counties could not succeed in wheat production and fruit culture, but with their bleak hills are exactly fitted for grazing, and the inhabitants are obliged to make a necessity of that for which their soil and climate are so peculiarly fitted.

As before stated my main argument is to unite in one the counties named as first and second classes, or those represented on the maps by the green and yellow colors, and with this purpose in view let us compare the results. In this comparison are included those counties having one cow upon an average of from five to fifteen acres.

In the State of New York, comprising this district, are 30 counties, and the area of these 30 counties named in tables Nos. 1 and 2 is 9,364,139 acres of improved land, and within this district are kept 1,028,348 cows, leaving only 322,313 in the remaining 30 counties of the State. There are also produced within this area 3,739,116 tons of hay, as enumerated in 1870, and if we assume that each one of these cows consumed on an average of two and a quarter tons of hay in wintering, we find that nearly two-thirds of all the hay produced was consumed by the dairy alone.

The amount of butter produced within this area was 76,834,241 and of cheese 21,020,288 pounds, which included nearly the whole amount of cheese produced in the State, and more than three-fouths of all the butter.

I suggest this query and append the answer as an appropriate thought in this connection. What is the area covered by these 30 counties so largely devoted to dairying? Why it would make nearly six States as large as the State of Connecticut, the cultivated area of each being considered.

In the State of Vermont there are five counties properly included in this class, Pennsylvania has 19 and Ohio 14 counties. These five counties of Vermont have of improved land 1,036,840 acres, which carry 89,730 cows. Within these five counties is produced 10,000,000 pounds of butter and more than 2,000,000 pounds of cheese.

The corresponding section in Pennsylvania has 19 counties, which are included in the dairy area, leaving 46 as non-dairying. About half of the butter of the State is produced in these 46 counties, and the other half, about 30,000,000 in amount, is produced in the 19 counties named above, which also produce nearly the entire cheese product of the State, about 1,000,000 pounds. The cultivated area of these 19 counties is 3,780,413 acres, and upon its pastures 336,575 cows.

Those present at the late International Dairy Fair, could not have failed to have observed that the enterprising citizens of Pennsylvania, had suspended in front of the gallery a large hand

bill stating that the annual production of cheese in that state is now twenty million pounds. This estimate, if correct, is an enormous increase, being equal in nine years, to about 1.900 per cent. I shall watch with increased interest the enumeration of next year, to see how and where this enormous increase is produced. Regarding this increase, Mr. Thos. J. Edge, secretary of the Pennsylvania Board of Agriculture, from date of the present year, says: "Only five counties report a stationary or lower estimate of cows, for the average of ten years; while fifty-three show an increase, varying from one per cent. to twenty." The corresponding section in the State of Ohio, is included in fourteen counties, with a cultivated area of 2,087,435 acres, which contains 163,730 cows, producing more than five and a half million pounds of cheese, and about ten million pounds of butter. The remaining counties of the State number 74, which are classified as non-dairying, but which produce about 40 million pounds of butter; which proves that dairying to a very moderate extent is very evenly distributed throughout the State.

From a careful analyses of the figures here presented by these varied comparisons, I am irresistibly forced to adopt this conclusion; that there is no locality where so large a proportion of cows can be maintained under natural conditions, on a given area, as in the best dairy producing sections of the State of New York.

And why is this if it is not because her soil and her climate are exactly fitted to the production of the very best product, and in quantities remunerative to the producer. I believe it is owing to certain elements which govern in the geological formation, as well as the peculiar adaptation of the climate. It is a remarkable fact that the water shed from our greatest dairying counties flows past every prominent seaport town in the United States, except the town of Boston. Need I name them? Montreal, Quebec, New York, Philadelphia, Baltimore, Cincinnati, St. Louis, and New Orleans.

From the most careful observation which I have been able to make, I have arrived at the deliberate conclusion that, upon an everage the product of five acres is essentially required upon dairy farms to carry a single cow and sustain the dairy. I am aware that a writer in the *Elgin Advocate* claims four acres as a fair estimate in Illinois, but it must be observed that a liberal daily ration of eight quarts of corn meal and oats is included in the estimate. I will admit that, at first thought, five acres seem extravagant. Take, for instance, the most favorably located farm of 100 acres, place upon it a dairy of twenty cows, and let it be the policy of this farmer to support and sustain the dairy by raising his own calves and other stock, such as is required upon every well-managed farm, with the annual cultivation of a certain number of acres each year, and I believe that

with the great majority of cases the average required would tend above rather than fall below five acres to each cow. Thus Herkimer Co., is the most compact dairy district to be found anywhere, and our figures tell us that there is one cow to every 6.1 acres; but from the census of 1875 the proportion is greater, 6.7 and this comparison rather confirms than disproves our estimate. But how is it in other states? Mr. W. I. Chamberlain, a careful and experienced dairyman of Summit Co. Ohio, in a recent communication to the *Country Gentleman*, thus expresses himself: "From the assessors' records, I find that not less than *nine acres* are required to summer and winter each cow. This counts pasture, meadow and woodland. From the books of several cheese factories, and from careful inquiry among dairymen, I find that $50 per year is a high estimate of the cash receipts to the cow, for the past ten years; and that present prices will not give more than $35.

We hear much at the present time about the extension of dairy industry into new states, and about the formation of new dairy producing centers. There is one universal law which governs all such enterprises, no matter what may be the theories of men, however plausible; it is the great principle of profit and loss. Who does not believe that the cotton fields of Mississippi, would be turned into dairy pastures, if there was more money to the farmer by the change; or that the corn fields of Ohio, and Illinois would be given to growing cotton if it was the more remunerative crop. The wheat fields of Minnesota may be fine dairy lands, but we know full well that the dairy lands of New York cannot profitably be turned into wheat fields. The present year has been one of low prices for dairy goods everywhere, and has affected the East and the West alike, but I am firm in the conviction that the dairymen of Central New York can carry on a successful competition with any section, provided they exhibit the same enterprising spirit, and employ their best skill; because of the advantages of climate, and their ability to keep more cows on a given area. Mr. John Smith, a resident of this county (Oneida), who has traveled quite extensively since the middle of September, in Central and Northern Iowa and portions of Minnesota, informs me that he found the average farmers of Iowa selling their butter at prices ranging from four to twelve and a half cents per pound, and this too in the face of the fact that Iowa was able to carry off the sweepstakes prize for butter, at the late International Dairy Fair. The census of 1875, was given to the public in February last, and is regarded as being the most complete and accurate of any census which has yet been placed in the hands of the people. I have prepared tables representing the relative merits of each county, on precisely the same basis as those of the census of 1870. And changes which five years have wrought are noted; and may be followed by a careful examination of the following tables:

CENSUS OF 1875.	No. of Acres of Improved Land to each cow.	Total Milk Production in Cheese	
DAIRYING COUNTIES.		Cheese Product per acre, lbs.	Lbs. of Cheese per capita.
Broome	9.7	35	197
Cattaraugus	7.7	37	271
Chautauqua	8.6	41	270
Chenango	8.2	40	399
Cortland	8	42	375
Delaware	9	38	407
Jefferson	9	34	291
Lewis	7.5	23	193
Madison	8.8	34	247
Montgomery	9.8	28	161
Oneida	8.3	33	149
Orange	7.4	47	177
Oswego	9.9	31	109
Putnam	8.7	31	171
St. Lawrence	7.8	37	315
Herkimer	6.7	46	335
SECOND CLASS.			
Alleghany	10.5	29	257
Cayuga	14.9	21	114
Chemung	11	27	95
Erie	10.8	20	46
Franklin	11	24	170
Fulton	13.5	36	168
Onondaga	12.2	21	71
Otsego	10.6	31	286
Queens	14.9	20	28
Schoharie	13	22	200
Steuben	14	21	147
Sullivan	12	21	120
Tioga	11.5	28	150
Tompkins	14	24	170
Ulster	14.3	17	52
Westchester	10.5	32	53
Wyoming	11.3	27	220
NON-DAIRYING COUNTIES.			
Clinton	18	14	64
Dutchess	15.6	19	96
Greene	16.8	12	122
Rensselaer	18	16	47
Schenectady	17	14	59
Schuyler	19	16	128
Washington	17	14	107
Wayne	16	16	95
SECOND CLASS.			
Albany	20	17	24
Columbia	25	10	69
Essex	22	11	65
Genesee	20	14	110
Hamilton	21	11	77
Kings	28	4	....
Livingston	28	7	50
Monroe	21	15	37
Niagara	22	13	70
Ontario	26	12	80
Orleans	23	13	85
Saratoga	21	12	70
Seneca	22	13	74
Suffolk	17	10	31
Warren	21	11	67
Yates	24	13	111
Richmond	13	16	5
Rockland	14	11	29

It will be noticed that the list of counties now numbers 16 in table No. 1, a loss of one only. This is the county of Otsego, and the change in its relative position results from the fact that it now has 2,839 less cows than it had five years before.

Table No. 2, of 1870 is increased by five counties, Otsego, Cayuga, Queens, Steuben, Ulster, and loses the county of Dutchess, which is transferred to the column of non-dairying counties. Dutchess county has 3,305 cows less than in 1870; and as it is a large milk producing county for the supply of the city of New York, this change may be attributed to the excessive transportation charges of the Harlem and Hudson River roads, which has driven the farmers out of the milk business. As before stated it will be understood that the counties named in tables Nos. 1 and 2, are classified together as constituting the dairy area of the state, and are arranged in classes, for the purpose of facilitating the comparison. The remaining counties of the State, 26 in number, are classified as non-dairying.

It is true that there is no system of classification which does not have its objections. The plan herein adopted seems to me more nearly correct than any I have yet seen, the number of cows forming an important element in the comparison, and without the cow there can be no dairy product. It will be noticed that the present enumeration uses the term *average number* of cows, &c. The number of cows kept in the State in 1874 was 1,339,816. This was 10,845 less than the number reported in 1870. These thirty-three counties, included in tables Nos. 1 and 2, have of improved land 10,148,705 acres, something more than two-thirds of the entire amount in the State. Within this area are kept 1,069,891 cows, leaving 269,925 to be distributed throughout the remaining twenty-six counties of the State.

Seventeen of these thirty-three counties sustain an increase of 43,039 cows, while in the remaining sixteen counties there is an apparent decrease amounting to 50,894 cows—a loss above the increases of 7,855 cows. I deem this feature so important in its bearing that I will name those counties where the increase and decrease are the most marked. Broome gains 3,285, Cattaraugus 5,074, Chautauqua 3,090, Delaware 3,443, St. Lawrence 3,656, Allegany 7,767, Cayuga 1,193, Chemung 759, Erie 1,772, Franklin 1,890, Onondaga 1,111, Steuben 5,366, Sullivan 2,146, Tioga 865 cows. Chenango Co. loses 3,090, Cortland 4,549, Herkimer 4,310, Jefferson 12,104, Madison 1,183, Montgomery 5,921, Oneida 5,317, Oswego 4,181, Otsego 2,839, Schoharie 3,071, Tompkins 884, and Westchester 823.

These gains and losses of cows make some curious transpositions when comparing the results of '70 and '75.

Thus Herkimer Co. has one cow to every 6.7 acres, the largest per acreage production, except Orange, while Delaware leads the per capita list, 407 lbs. The per capita of Herkimer in

1870 was 496 lbs. Cortland then had one cow to seven acres, now one cow to every eight acres, with a per capita production of 375 lbs., something more than one hundred pounds less than five years ago, which shows how its proportion is affected by the loss of 4,500 cows. Jefferson, with a loss of 12,000 cows, in 1870 had one cow to each 7½ acres, while the proportion now required is nine acres—a per acreage product of 34 lbs., a per capita of 291 lbs. Delaware, with its increase of cows, has changed from 9.8 acres to each cow to 9, the same as Jefferson, the latter having a less per acreage product of four pounds, and per capita 116 lbs. less. In 1870 Oneida and St. Lawrence stood side by side—one cow to every 7.6 acres. Oneida now has one cow to every 8.3 acres, a per acreage product of 33 lbs., a per capita of 149 lbs.; St. Lawrence one cow to 7.8 acres, per acre 37 lbs., and per capita 335 lbs.

Thus, Allegany Co., which shows the largest gain of cows of any single county, 7,767, which, in 1870, had one cow to each 12.7 acres, now has one cow to 10½ acres, a per acre product of 28 lbs., per capita 254 lbs. Erie has changed from 10½ acres to each cow to 10.8, a per acre product of 20, and per capita 46 lbs. This proportion is affected largely by the non-producing population of the city of Buffalo, and illustrates how unsatisfactory is any per capita comparison. It will also be borne in mind that there is a general increase in the number of acres of improved land in nearly all these counties, which accounts in part for the variation in the first column of figures. It will be noticed that Essex Co. has gone to dairying, and instead of having one cow to nearly thirty acres, as in 1870, now has one cow to every twenty-two acres, and thus makes Livingston and Kings counties head the list of non-dairying counties, having one cow respectively to every 28 acres. Livingston makes a per acreage product of 7 lbs., and per capita of 50 lbs. Ontario, one cow to every 26 acres—per acre 13 lbs., per capita 80 lbs. Yates Co. one cow to 24 acres, a per acre product of 13 lbs. and and a per capita of 111 lbs.

The census reveals the fact that there has been an increase of 658 cows in the county of Ulster, and a decrease in the county of Dutchess of 3,305 since 1870. Considering that both these counties are in the milk supply district for the city of New York, which is very stable in its demands, we are led to inquire the cause why the counties have changed places in our tables. The cause is plainly to be seen in the excessive freight charges exacted by the railroads transporting milk for the city of New York, which is rated by the can. A can of milk is estimated to weigh about 110 pounds, and the freight tariff on the Harlem, Hudson River and New Haven roads is 60 cents per can. No matter whether this milk is carried 40 or 80 miles the tariff is the same, which is more than 50 cents a hundred, The Erie charges 55 cents a can, or just 50 cents a hundred.

with the additional cost of ferriage. The receipts from an ordinary freight car of milk, holding 240 cans, is $144, and this for every day in the year. The Erie road charges for local freight by the single package, or more, for first class freight, 28 cents; second, 22 cents; third, 15 cents; and fourth, 11 cents per hundred. Now, what is rated first class, are bulky articles, such as empty barrels, boots and shoes, corks, feathers, hair, glassware, furniture, &c.; and if a car were filled it would scarcely contain five tons, and for the same distance that the milk is carried the company would receive $28, while a car of milk pays $116 more.

The Harlem road formerly carried over 4,000 cans of milk per night, at a revenue of $2,500, but the price of freight drove many of the dairymen out of the business, and this road now carries about 2,500 cans at a nightly income of $1,500. The Hudson River carries about 800 cans, and the Long Island road about 600. The Long Island road carries milk from any point in Queens county for 30 cents per can, and makes money at it, too, and this is the reason why the dairy business is sustained on Long Island. Consider the saving to the farmer on one single can of milk for the year at 30 cents per day, and we find it to be $110, a handsome saving to the dairymen. Ulster county has enjoyed better facilities than Dutchess from shipment by the river. The price before the war was from 15 to 20 cents per can freight charges. Senator Robertson, of Westchester, is responsible for the statement made by him at Albany, last winter, that the farmers of his county had told him that unless there could be a reduction in freight charges they would be compelled to carry their milk to the boat as the railroads were taking the bread out of their mouths.

The fact is also brought out from the census report that there is no skim cheese made either in Herkimer, Jefferson or Oswego counties, and I am afraid the enumerator didn't look sharp else he would have discovered his mistake. But there was one thing he could not find, and that was no whole milk cheese either in Tioga or Delaware counties. The skimmer is the siren which misleads us. Let us hope that the day is not far distant when its use in cheesemaking will be unknown. It is the skimmer which causes our fine American cheese to be sold in the foreign market as English cheese. It is the skimmer which causes so much of our poor cheese to be sold in the English market as American cheese—cheese so poor in itself that it can't be sold at home and must be slaughtered abroad. It is the skimmer which causes our American cheese to sell in the English market at 50 shillings, while the English sells for 84 shillings in the same quotation.

Mr. Wheaton, of this city, an extensive purchaser of dairy goods, and a prominent member of the Utica Dairymen's Board of Trade, informs me that he scarcely finds more than one pack-

age in ten of what may be termed strictly fine butter, and what a fearful commentary is this upon the intelligence of the dairymen and dairywomen of Central New York. If you are a buttermaker, my fellow dairyman, when you go to your home carry with you the resolution that you will strive to make better butter than your neighbor; strive to improve the quality of your make. If you are a cheesemaker, when you reach your home throw away the skimmer; don't make butter and cheese out of the same milk. Quit making these miserable skims, which are unfit even for cart wheels—which clog our market at home and destroy our reputation abroad.

Our product is too valuable that it should be put in jeopardy by our own folly. The 33 counties, which constitute our dairy area, make of butter 83,478,730 pounds and of cheese 95,988,720 pounds, while the product of the entire State is of cheese 98,725,172 pounds and of butter 111,873,361 pounds. I remember to have heard a gentleman, two years since in a public meeting of dairymen in Central New York, say, that the reason why dairymen of that locality refused to attend a public discussion of the methods of their calling, was that the men, who came to speak to them were men of theory, and they considered themselves too practical to be benefited by discussion, and as a consequence they came to town: but while the discussions were in progress they spent their time at the stores sitting on the dry goods boxes. A sentiment of more supreme conceit could scarcely have been uttered. I speak of it here from no unfriendly spirit, but because its counterpart is to be found in every community, and its existence is to be deplored. That man, who is too old to learn anything new of dairying, is entitled to the commiseration of his fellow men. While our dairymen have been consoling themselves that they knew it all, and were the producers of goods which could not be beaten, the superior enterprise of citizens of other States has shown them their folly, and have borne off the prizes at our fairs by default.

I have no means of knowing of the extent of our exhibits at the late International Dairy Fair in butter, but believe it to have been fairly creditable—but our exhibit of cheese was disgracefully deficient. If dealers are unwilling that the cheese, which they usually handle, should be shown at our fairs, through fear that some one may discover where their fine brands of goods are made, and thus compete for them, dairymen should insist that they be entered for competition, for public opinion forms a correct estimate of the industry of any people by the exhibition of their products. If dairymen of our State would seek to propitiate public opinion by a suitable display of their goods, on appropriate occasions, and use their best intelligence in the production of their products, then I believe New York can defy the competition of the world, but without this constant effort we must lose.

THE PURIFICATION OF BUTTER.

BY LEWIS T. HAWLEY, ESQ.

The theory of the formation of butter is very simple; the little fat globules are broken by agitation, and the butter coheres together in a mass; but as is well known in the practical carrying out of this process, considerable difficulties arise which modify the result of the process. The fatty matter (butter) obtained by churning cream or milk is not pure, but still contains foreign matter, especially caseine and sugar of milk, which are the ingredients which cause its decay. Pure butter from the cow was found by Bromeis to consist of: margarine, 68; oleine, 30; butyric, capric and caproic acid, with glycerine, 2–100.

Ordinary butter, in addition to these ingredients in variable, proportions, always contains casein, water and sugar of milk, together amounting to from 10 to 20 per cent. The rapidity with which even well-made butter undergoes a change, especially when exposed to the air, is well-known. This change is mainly due to the presence of milk, sugar and casein. Exposed to the air, they change, the former into lactic acid, and the latter into substances that are disagreeable to the taste and smell, and capable of inducing a decomposition of the fats of the butter. The glycerine separates from the acid, and since of the latter a number possess bad taste and odor to a high degree, they impart these tastes and odors to the butter, and the butter becomes rancid. Of these acids, "butyric acid has an odor of human excrement, caproic acid that of sweat, capric acid has a rank smell resembling that of a goat, while caprylic acid is the only one which is not obnoxious to the senses."

The effect of salt in butter is mainly to give it such a flavor as would make it palatable to the various persons who use it, and assist in freeing it of its cheesy matter. Butter will become frowy nearly as soon with a salt flavoring as without any, yet it is generally believed that salt keeps or preserves it from putrefaction. If I should be able to correct this error, or even to arouse thought and investigation on this question, I am sure it will be an important point gained. If the use of salt practically only flavors butter, the same as in the case of beefsteak for the table, how, then, shall we preserve it? There is but one way

to accomplish this most desirable object, and that is so well understood by good dairymen that it seems almost superserviceable to take up the time to elaborate upon it. I have made experiments with fresh and salted butter, and found that there was no perceptible difference when exposed to the atmosphere, in its becoming frowy. The amount of salt used to flavor either butter or fresh meat for the table is not sufficient in quantity to have scarcely any appreciable effect in that direction. One barrel of 190 pounds of fresh pork requires 56 pounds of solar salt, and some three to four gallons of saturated brine in addition, in order to thoroughly preserve it, making 68 to 70 pounds of salt for 190 pounds of pork.

My object in making these statements is to more fully impress upon dairymen the necessity of manufacturing, packing and storing their butter so well that it will keep without salt. Use salt that is made expressly for the dairy, that is pure, for the purpose of washing and flavoring it, and for freeing the butter of cheesy matter and buttermilk, and discard the idea that you can make butter in an uncared for, slovenly manner, and salt with this or that kind, foreign or domestic salt, and have butter that is strictly fine. Salt is an antiseptic, and has a preserving effect, so far as it goes; it also hardens and causes it to be more compact. Butter should not be worked before salting, as the grain is much more tender. It is undoubtedly true that it will bear three times the working after salting than it would before. It is perfectly obvious that dry salt can have no effect only as it becomes dissolved; therefore, if saturated brine is used in washing butter, it would require little or not any salt for present use, or even long keeping.

Dr. Goessman, of Amherst, Mass., one of our best authorities, says that concentrated salt water reduces the amount of cheese matter, even in a moderate working, in consequence of the solubility of cheesy matter in concentrated salt water. Poor butter cannot be made into good by the use of the best salt in the world; neither can first-class butter be in any way injured by the use of pure dairy salt in the proper quantity for flavoring it to please the most critical epicure. If, after the butter has come and the buttermilk is drawn off, the butter is taken from the churn before it is gathered, and put in a sieve made for such purpose, and clean cold salt water poured on it, it will be sooner freed from all the buttermilk and cheesy matter than perhaps in any other way. The pouring of salt water on it should be continued until all the buttermilk is rinsed out. It should always be borne in mind that it is the cheesy matter and buttermilk that is left in the butter, that causes it to frow, and not the salt. A fishy taste is sure to be discovered in butter where the salt or butter comes in contact with fish, from the fact that salt, milk, cream and butter are absorbents.

In the manufacture of strictly fine butter, everything should be done in a scrupulously neat and careful manner and at the proper time.

All milk vessels should, in their last rinsing, have boiling water or hot super-heated steam applied, as nothing short will destroy the putrefaction which is abundant in milk vessels not thoroughly cleansed. Instead of transferring the butter into a sieve, as I have directed in my old essay, I would draw off the buttermilk as soon as the butter comes to the size of a wheat kernel, and pour on cold saturated brine, made from pure dairy salt, enough to float the butter, and let it stand some thirty minutes; then draw off the brine and float the butter again in cold saturated brine, letting it stand some forty minutes. The object of letting it stand in the brine is to more perfectly dissolve the cheese matter and sugar of milk, so that when you draw off the brine you leave the butter nearly or quite free from the two substances, which, when coming in contact with oxygen form butyric and other acids, so deleterious to butter. Then carefully transfer the butter in the same form, without any working, into a thoroughly cleansed firkin or vessel, air-tight, which you have partly filled with pure saturated cold brine. When you have filled the firkin with butter, head it up, having a hole in the head, so that the firkin can be filled full of brine, and keep it in a cool, sweet place.

I predict that butter will be kept and sent to market in this condition. And when customers use butter without salt, it can be taken from the brine while in this pellet form, and washed with fresh water entirely free from salt, and worked together for the table; or, when wanted flavored with salt it can be worked into shape for use. In either case it can be placed in market and on the table in large or small quantities, superior in quality to butter treated and shipped to market in the usual way.

Mr. President, and fellow Citizens: It appears to me that I shall fail to discharge my whole duty if I neglect to bring to your consideration a few reflections upon the importance of encouraging diversified industry, and home markets. You have already learned much of the laws of chemistry, and have applied them to the cultivation of your lands. You understand the chemistry of air and water, and of soil, and of the component parts, and degrees of such parts, as constitute the cheapest and yet the most advantageous dressing for your lands, and you know something of the specific needs of different plants, vegetables and trees, and the degrees of moisture, and of heat and cold, they severally demand, and can endure, in order to growth, and health and production. In all these particulars, there are as yet boundless fields to explore; and when fully

explored and mastered, they will furnish a revenue of wealth from the lands you now cultivate, over that you now harvest. The discovery of the laws of chemistry, as even now applied to the cultivation of the soil, and the growing of crops by the aid of labor-saving machinery, is as great and almost if not quite as important as the discovery and development of the art of printing, which has changed not only the mode of education, but the relations of human brotherhood. Before this discovery, books and the scholar's education were analagous to the rude tools which the mechanic must have, or he can do little, or no work. To-day, the scholar's tools lie ready to his hand in every library. And so also the tools of the farmer and the science of chemistry, and the arts of the mechanics, and the laboratory of nature, and the schools, are all within the farmer's reach. And this complete education, consists in knowing how to use and apply them. A mere professional knowledge of them will be but little consequence to you without practical use of them. When we have learned these uses, and become skilled by practice in using them, our yearly harvest will be doubled, and our labors doubly rewarded, providing always we have taken care to secure home markets for our productions; for if we rely upon foreign markets, whose operatives at the wheel and loom are reduced to almost starvation prices, the price of our products must be reduced from that of remunerative labor; and, in addition to this, we must pay the expenses of such transportation to the said foreign markets, thereby taking upon our hands to support that vast number of men with their families who are required for the service of transportation. To create home markets for our productions, we must develop the vast resources of our country, and bring its incalculable motive power into service, with the great multitude of idle hands which are now seeking employment. Our iron and other mineral deposits, which are the most extensive and the best in the world, must be opened up and worked. These mineral deposits, with the broad fields of coal to work them with, belt the continent on which we live, and are in sufficient quantities to employ the inhabitants of the entire globe for thousands of years. Why should we allow ourselves to be longer chained to the manufacturing houses and shops of despotic and monarchial Europe, by our policy of government, by permitting their downtrodden people to manufacture for us those articles we can and ought to manufacture for ourselves? Why not commence at once, through a proper regulated governmental policy, the development of our own resources? Why not, through a like policy, commence building up manufacturing houses and shops in all our cities and towns, and in other places contiguous to the resources to be developed? Why not, by the same policy, bring into these houses and shops skilled masters to instruct

the masses who are knocking at our doors for employment, and need this kind of education? Only in this way shall we have home markets, steady and fair prices for the productions of our farmers! Only in this way will we have home-skilled artisans! Only in this way will our government be fortified against a foreign enemy! Only in this way will we have in time of war our resources developed! Only in this way will we have a population of educated and skilled artisans, filling our manufacturing houses and shops, ready to construct our guns and cannon and ships of war, and of commerce; and then, too, we should be able to contend successfully against the combined governments, of the earth, without borrowing a dollar or purchasing a needed article from either our friends, or our enemies abroad, in the hour of our extremity. If our government pursues a different policy from this, and plunges into what is now termed in honied phrase, reciprocity with other governments, which many are now seeking to force upon the United States, then will be opened through these channels all our ports to the commerce of all the governments of Europe, as well as that of England, free of duty. The sad and disastrous results of such action could not be calculated. It would stop, or at least impede the work of every spindle and loom, and forge, and furnace in the United States, and throw out of employment thousands of our skilled artisans, and reduce the price of labor in all departments of business, including the productions of the farmer, at least twenty-five per cent. But to insure true prosperity, such as we have indicated, we must procure and firmly establish a permanent protective financial policy, and a medium of exchange sufficient in volume but without inflation, to carry on the business of the whole country. But to be merely the master of the science of government and of governmental policy, or to be merely the master of the art and science of farming, will not secure the mastery and joy we most need for perfect happiness. Knowledge is the best riches we can possess. A happy life is like neither a roaring torrent, nor a stagnant pool; but to a placid and crystal stream, that flows gently and silently along. Such a life will fit us to bear, if not to do, all things; to conquer our passions and fears, and to meet and overthrow the powers of darkness. And no more can true knowledge be found complete in the lore of antiquity, nor in the sciences. If it were possible, we may fathom these and store in our memories all the sayings and doings of the dead and living, without finding the depth and the wealth of true wisdom, or a true knowledge. To have only worldly wisdom, or to have merely a knowledge of the sciences, is not a true knowledge of man, nor can such wisdom be considered a triumph over ourselves. The real master or that sterling knowledge which makes man better and happier, and fits him to assist the virtue and happi-

ness of others, is a knowledge of himself. All learning however is useful, and all the sciences are curious; all the arts are beautiful; and each and all are needful; but more useful, more curious, more beautiful and more needful, is that perfect knowledge and perfect government of ourselves. For though man should read the heavens, weigh the planets and the stars, count their number, measure their several distances from each other, unravel the laws and revolutions of the wheeling orbs on high, and dive through all space into the mysteries of all matter and all force, and be able to expound the phenomena of the whole; yet he might not be wise enough to know the secret springs of his own mind, or the foundations of his own opinions, or the motives of his own actions, unless he held in absolute control the reign over his passions.

CHEESE AND CHEESE MAKING.

BY PROF. L. B. ARNOLD.

Cheese is a partially digested coagulum of milk. It has for its basis a single constituent—casein—in the compound fluid from which it is derived, but it carries along with it into its composition water, and no inconsiderable part of the fats associated with it. All the skill of the cheese maker centers on this one constituent of milk. It is on this that he rings all the changes which are to measure the value of his cheese as food, and determine its commercial importance, according as he comprehends the peculiarities of this constituent and the influences of the agents he applies to it. Having a single substance on which to act, and one principal agent—rennet—to act with, modified by temperature, fat, salt and moisture, it would seem that comparatively uniform results might be reached. But the fact is otherwise. In flavor, cheese grades down from the delicious Brie, through strong, sour, sharp and bitter, to putrid and vapid. In consistency it may be moist or dry, tough or tender, plastic or hard, crumbly or doughy, and so on. These and other peculiarities, singly and combined, give rise to more than a hundred distinct and established varieties. Though we have a great many shades in the quality of cheese, we have but few distinct varieties peculiar to the United States.

We have our factory cheese, and dairy cheese; our young America of only a few pounds, with an occasional mammoth of several thousands. We have our rectangular and pineapple, and our sage cheese flavored and mott'ed with our favorite aromatic salvia. We have also our acid and no-acid and our inevitable skims, and as for the rest they are mostly imitations of European varieties of which we have some 20 or more. In Europe the number of varieties is much greater, running somewhere from 70 to 100, including all that are made of the milk of cows, goats, sheep and buffalos. It seems almost astonishing to see how many varieties can be produced from the simple materials to start with and yet each kind finds consumers who prefer and admire it.

It is said there is no accounting for tastes, and it does sometimes seem impossible to do so; but I think the taste for the different varieties of cheese can be pretty satisfactorily ac-

counted for on the score of habit. The preferences of appetite generally are largely due to habit. One may learn to like or dislike almost anything that will contribute to the support of human life. Habit will obliterate or modify an old taste, or build up a new one, or even pervert natural instinct, if time is given to operate in. We are daily witness to the fact that habit converts what, to the uninitiated human taste, is the most offensive, filty, loathsome and poisonous plant in the whole vegetable kingdom, into a delicious morsel to roll under the tongue. It gradually fills a potion, well known to be loaded with destructive poison and ruin and death, with seductive charms which easily lure to certain fatality. Considering the force of habit, it is easy to account for tenacious preferences of taste, and to understand why one man will pay a high price for a variety of cheese, which another man would require pay for eating; but it makes it exceedingly difficult, with all the warped tastes of humanity to counter-balance, to decide what conditions or qualities must enter into cheese to make it absolutely or inherently best.

A query here suggests itself. Suppose samples of all the different varieties of cheese in the world, including those made from the milk of cows, goats, sheep, deer, buffaloes, asses, mares and camels, should all be brought into one collection, and judges, one from the consumers of each variety, should be selected to award a sweepstake prize to the best cheese in the world, their award "to be based upon inherent and comparative merit." At this great international cheese fair, by what standard of excellence, or by what taste or idea of merit, could they be guided in their decisions? Would not each judge, guided by the light of his own habit and taste, artificial though it be, feel a conscientious assurance that he would be right in voting for his favorite cheese, and thus each variety get just one vote and no more? With personal preferences all equally strong, who is going to give way; and what argument can either use to establish a preference that shall be convincing or reasonable?

Let us suppose for a few minutes that the judges for such an occasion are assembled in council, and that we are listening to the arguments we may suppose they would make. We will suppose an Englishman rises first, and with an air of confidence, assures his honorable associates that he represents the highest civilization and intelligence and culture on the globe, and therefore a taste which is most refined and accurate, that the people of this country will pay more for Cheddar cheese than any other, which is an evidence that it suits their taste best, and therefore is the best, and that all the nations of the earth should yield to his views of excellence. Without even a thought that somebody else could apply just such an argument to his own

case, he sits down satisfied with himself. He is followed by a Frenchman who evidently feels a pride in referring to the leadership of his nation in the delicacies of cuisinery and insinuating, as only a Frenchman knows how to, that the English taste is a little obtuse, insists that the exquisite taste accredited to his people ought to be the highest authority in all things relating to human appetites, of which cheese is one, and holds up one of his favorite Roquefort cheese as an evidence that he is not claiming too much. He urges that this cheese of his nation's choice is made from the milk of sheep and goats fed on the best of pasturage, and that the offensive odor of these animals, which to some extent attaches to their milk and cheese, is well toned down with plenty of barley meal, and the finishing touch of the cheesing process is done in a cave—a touch of which no other nation can boast. Here he rests his argument, and is succeeded by an Italian who holds aloft his national cheese, the little Parmesan, and with an insinuating air exclaims, "All the world admire aromatics, and esteem them as luxuries. These luxuries, which are wanting in all other cheeses in the world, are woven with all their highest excellence into mine, which is green with herbs and teeming with fragrance." Now a Swiss arises, and lifting his broad Gruyere upon one edge perpendicularly, and turning it to display its four foot disc, he turns upon the Italian with a sneer, while he thus addresses him: "Your cheese is the product of skim milk. It is made with an acid and is dry and hard, and in itself tasteless. It has no flavor of cheese, but only the taste of herbs, which is none the better for being mingled with your skim cheese. I hold here, gentlemen, a cheese every way desirable. It is made of milk from grass on the verdant slopes of the Alps, acknowledged by all travelers to be the richest and highest flavored grass in the world. All the fine qualities of this grass are embodied in the meat of this cheese, and the perfect transformation of them into cheese is demonstrated by its tenacious texture and its numerous holes a half inch in diameter, and by its strong characteristic odor." After him an American shipper, fresh from the proud metropolis of his vast and growing nation, now attracts the attention of the audience. After talking awhile in fabulous numbers of the immensity of the herds which roam over his boundless pastures, and with astonishing figures measures the enormous imaginary products of butter and cheese they annually produce, and of the matchless skill of American factory men, he turns to his Italian friend, and with a knowing look, assures him that the holes in his cheese, of which he was so proud, are only a blighting curse, that no cheese can be good which contains holes, no matter what else there may be about it, and further that his cheese does not smell right, because it does not smell like the hundreds

of millions of pounds which he handles; and by way of demonstrating what a superior article is, he holds up a sample of American shipping cheese made on the acid plan, with one-quarter of it cut away to show the interior. Here he says is a cheese worthy of all praise. You see it has no holes in it. It is firm and rigid. It has no smell of cow, or goat, or herb. Whatever there was of bad smell in the milk of which it was made has been covered up with acid by soaking the curd in sour whey. Its flavor, to be sure, is only negatively excellent: but flavor is of little consequence. It has no bad flavor, and in color it is faultless. Before making, the milk was stained with just the right hue. You see how exactly it is developed in the completed cheese. As I turn the cut surface one way and the other, you see it glows with all the redness of a sunset reflection from a storm-laden cloud. This is important. In judging of cheese we put nothing before color. There are three things that go to make up a perfect cheese. They are—first, color; second, freedom from holes; and third, firmness to endure the hardships of commerce. Some folks add a fourth item of flavor, but that is not essential. I think so little of it that in judging of cheese I never taste of it. Now here you see all that is essential combined in this sample. It is indeed a perfect cheese, and when it goes to market the English will pay for it the full price of their best Cheddar cheese, with only 40 per cent. off.

"Oh! mein Cot en himmel!" exclaims a German as he rises with slow dignity, with eyes glistening with a sullen earnestness, and the perspiration starting from his lymphatic pores. What is this I hear?—an Englishman boasting of his huge Cheddar, hard and dry, and which he himself must accompany with ale before he can digest it; an Irishman, extolling his mouldy barley bread with a gouty odor; an Italian, flourishing his skimmilk cheese and herbs; a Swiss, exulting over an ill-shaped thing, tough and full of holes, the work of putrefaction, and with only a faint smell of cheese; an American, praising a cheese with earthern hardness, that has neither taste nor smell, and is mostly valuable for the dye stuff it contains? If you want to see a cheese what is a cheese, he shouts, as he, to show its texture, crushes a bit of Limburger in his huge hand till it squeezes through his fingers in long flattened curls, look here, and see a cheese solid, yet soft; rich, yet can not spoil; a cheese one can live on and grow fat; a cheese full of flavor; and as for smell, you have nothing to compare with it; and with an assurance from feeling master of the situation, he thrusts his crushed Limburger successively under the noses of his competitors, and there is an end of all argument.

There is no use in extending the scene. If we were to run it through the whole list of nations, we should not be likely to get any other criterions by which to render judgment, than those growing out of local habits and preferences. An arbitrary standard, with little or no reference to intrinsic value, is the rule by which judges, dealers and makers decide upon it. Even at the late International Fair, it did not escape preferences which were local and narrow, and insignificant when considered with reference to either inherent or comparative merit. I am not about to complain of or censure the judges. They were men of intelligence and much experience in their way, and honorable above suspicion. But their views of merit seemed to be too narrow. Neither they, nor the Executive Committee who laid down the rules to guide their judgment, appeared to take the broad view which judges at an International Fair should take. The committee required the judges to give just as much weight to the color of cheese as to its flavor or texture. There is absolutely no merit to color in cheese, as it does not at all enter into its inherent value, and most nations disregard it entirely ; or, if regarded at all, they prefer other appearances than those valued so highly in New York.

Then an all-important point was compactness in the meat of the cheese. It must not be porous in the least. It is nothing against a cheese that it is solid. It is a circumstance rather in its favor, but then it is not all-important. A cheese may have great inherent value without being perfectly solid. The Gruyere is full of holes, and yet is one of the most valuable cheeses made, and would live to bury a half dozen generations of our solid acid cheese.

The fact is the scale of points and the judgments rendered were, so far as I could learn, all based on the English taste, which is in many respects arbitrary, whimsical and foolish in the extreme. What sense in having a cheese just such a shape, just such a color, just so hard and dry, just so solid. What chance would an exhibit of Gruyere, a Brie, a Roquefort, (cheeses which have pleased more tastes than any other in the world,) stand in the estimation of judges whose views of merit are tied up with English whims, for I can call them by no more appropriate name? It was perfectly natural, and so far as we are concerned it was well enough to limit our views to English preference, whether well or ill founded, so long as we depend on England for a market for nearly half the cheese we make. It is to our interest to understand her caprices, and cater to them, too ; but when we come to judge between the nations of the earth, who have their local preferences, too, we must or ought to fall back upon inherent and absolute merit. I have called the attention of the Convention to these points, not to

find fault with or blame any one for what has passed, for I have no blame to bestow. I feel more like giving thanks and praise for exertions and sacrifices for ensuring success. We are establishing an International Dairy Fair Association, and if we would succeed and make the institution worthy of the name it assumes, we must conduct it with broader views than leveling everything down to English prejudices or English tastes.

I have another purpose in view in calling your attention today to the intrinsic merits of cheese, independently of English views. The time is soon coming—is indeed at our very doors—when we must look to some other source for marketing cheese than with our English cousins. We are now crowding upon them all the cheese they can possibly use, and all in the state of their finances they can afford to pay for, except at very low rates. We have facilities for producing cheese in quantities immensely greater than we are now doing, and it is very desirable to utilize them. With an open market cheese is a profitable and stable production, and it is to our interest to make it so that it will please the general taste of mankind as well as that of our present special customer. To do this successfully we must study the average taste of humanity, and if we are successful in meeting it, our goods will have the world for a market, and all we can make will bring an equivalent for our pains.

As we have seen, cheese has for its principal foundation an albuminous constituent of milk, casein, and such other matters as it can carry along with it, as fat and water, holding in solution sugar and albumen. It is not the fact of the presence of these constituents of milk in the coagulum, or curd, which makes the mass a cheese, or gives it inherent value. It is never cheese till it undergoes a certain change, and when that change does occur it becomes cheese, and has a value as such, and not till then. In that change the atoms of casein have their affinity for each other weakened, so that they easily separate, and if placed in water, separate entirely; or, if you please, dissolve, and instead of being, as we say, tough or curdy, the mass becomes plastic. This plasticity makes the cheese digestible, and gives it an inherent value as food. Until this change takes place the casein in the curd is insoluble, and extremely difficult, if not impossible, of digestion in the human stomach. The more complete this change, the more plastic and soluble, the more rapid and complete is the digestion of the cheese. This change is the result of digestion induced by gastric juice obtained from the rennet, or its equivalent, used in curdling the milk.

While the casein is undergoing this change, the fats, which were in the milk, also become changed and assume new flavors,

which give to the mass the characteristic flavor of cheese. This change in the fats of the milk is invariable, and it keeps pace so evenly with the action of the rennet on the casein, that the amount of flavor in the fats is a good measure of the change in the casein.

The thousand and one variations occasioned by modifications in manufacture and curing and in the composition of milk and added matter, foreign ferments, or other outside influences, vary the flavor from the exquisite delicacy of the semi-fluid Brie down to the odoriferous Limburger, or to the insipid skims. But however much this flavor may be modified, it always has beneath its modifications a characteristic flavor of cheese, which distinguishes it as cheese, and without which it would not be entitled to that name.

All the flavor of cheese lies in its fatty matters derived from the milk, and the peculiar flavor they assume depends upon the modifying influences brought to bear upon them. The casein is in all its stages tasteless. When we dissolve out the fats with ether we carry away all its flavor, and the cheesy matter is left entirely insipid.

Thus, in the dietaries of the world, cheese has two absolute values, one as food and another as a luxury.

It is on the condition of perfect and easy digestion that its inherent value as food depends, and just in proportion as it fails in this respect does its value depreciate. It is this digestible condition, this availability of the whole or a part of the substance of the cheese for food, which the expert should be able to recognize, and the judge to regard, when he is called upon to decide upon inherent value.

Its value as a luxury depends on the development of cheesy flavor in its fats, as described. If this has been well developed and gives a clean, full and pure taste of cheese, uncontaminated with sourness, bitterness, taint, or other offensive or undesirable flavor, the pleasure which it will give the palate will cause the cheese containing it to bring a price above its value as food —just as perfumery brings a high price for the pleasure it gives the sense of smell. The fats in cheese enter into its food value also, for which they are always in a condition to be availed of. But it is the degree of flavor and its purity given to them in the ripening of the curd, which is the measure of the value cheese may have as a luxury, and is what experts should be able to appreciate, and judges to value, when called upon to unite it with the food value of cheese.

A few words illustrating the practical bearing of the condition of casein upon the value of cheese as food, may not be altogether out of place in this connection. If a cheese is curdy and tough in texture, as is usually the case with skim cheese,

it will, to the extent of its toughness, be insoluble and indigestible, and to the same extent useless as food. It is not uncommon to find a tough skim cheese which has more than half of its weight consisting of casein, with less than 10 per cent. of its casein digestible, the rest of its cheesy matter being a total loss so far as food is concerned.

There is a difference of opinion about the value of skim cheese as food. Some suppose that because analysis shows it to contain a much larger per cent. of albuminoids than whole milk cheese, sometimes as high as 50 to 60 per cent., that it is worth more for sustaining the frame work of the body than full cream cheese. But chemical analysis is not always reliable as a guide to the value of food, especially for human use. It is reliable in one respect. The nutritive value of food cannot go beyond the amount which analysis shows a food to contain, but it may fall a great ways short of it. To illustrate: The analysis of a raw potato and a cooked one will be alike as to albuminoids, but unlike in their food values. A cooked potato is worth a little something for human food, but the raw one is worth nothing. Difference in condition is everything. Hair, hoofs and horns have a composition similar to flesh, but they are indigestible, while the flesh is easily digested. So grass contains three per cent. of albuminous matter, and apples less than one. I would like to see the man who could get a better living by eating grass than by eating apples. As casein in the form of curd is insoluble and indigestible, and as the casein in skim cheese remains in the form of dried curd, very little of it ever being changed from a curdy to a cheesy condition, the casein in the uncured skim sustains the same relation to the well cured whole milk cheese, that the hoofs, hair and horns of a bullock do to his flesh, or as a raw potato does to a cooked one, for human food. An ox might make as good use of the raw potato as a cooked one, and an alligator might make a savory meal out of hair, hoofs and horns, and possibly out of a tough leathery skim, but they would all be very poor food for humanity.

That cream in cheese is an essential to its digestibility is proved by experiments in the artificial digestion of skim cheese. Last winter it occurred to me that the value of cheese as food might be clearly approximated by digestion with pepsin. As the stomach of the omniverous hog has an action very similar to that of the human stomach, pepsin derived from swine with a little addition of hydrochloric acid, a little of which is found in the human stomach, would furnish an imitation of human gastric juice so near like the genuine, as to make experiments with its useful in determining the behavior of cheese in the human stomach and its approximate value for human food.

The gastric juice of the hog is more powerful than that of the human, and if cheese failed of digestion under its influence, it would certainly fail in human digestion. I presented my idea to Dr. F. E. Engelhardt, of Syracuse, who, as most of you probably know, is one of those accomplished chemists for which Germany, his fatherland, is so celebrated. He was favorably impressed with the suggestion and the value which would be likely to result from a series of experiments in that direction, and very generously offered to join me in carrying it out and to donate his time and services without compensation, and in the same generous way the American and Excelsior Salt Companies placed their laboratory with all its contents at our command; even sent Dr. Engelhardt to collect such samples as he could obtain, and we went to work, Dr. Engelhardt giving personal supervision to all the work and doing most of it with his own hands. We have made about fifty experiments in digesting cheese and nearly as many analyses besides a number of experiments with butter, devoting all the time we could possibly spare during the year and including in our work every variety of cheese we could find in the markets of New York and elsewhere. Quite a variety of samples obtained at the late International Fair have not yet been worked up.

I have constructed out of these experiments a table in which there is a brief description of each variety of cheese treated, with an analysis showing the water, fat, casein and ash it contained with brief remarks upon the digested product. The table, which is too lengthy to read here, will appear in the report of the Convention. The points which the experiments have developed are:

1st. That the most thoroughly cured cheeses digest the soonest and most perfectly. That cheeses from 30 to 60 days old not only digest more slowly than older cheese, but so much more imperfectly as to occasion a serious loss of food in their use, besides, as we know, they affect health unfavorably.

2d. That where other conditions are equal, the rapidity and completeness of cheese digestion is in proportion to the amount of fat the cheese contains. This fact has appeared so favorably, that skimming is always betrayed in the digestion, and enables the experimenter to make a close prediction of the per. cent. on fat the analysis of the cheese will show.

3d. That the less the natural action of rennet in ripening curd and converting it into cheese, is allowed to be impeded by the presence of acid, the easier will the cheese digest and the more nutriment will it yield. This has appeared as a striking fact running through all our observations. And it has seemed to matter little whether the interfering acid was developed in the whey in which the curd was kept lying, or whether

it was derived from an excess of whey remaining unextracted in the pressed curd.

4th. That according as the curing of a cheese approximates or reaches its best condition for the perfect digestion of its gaseous matter, are its fats acted on by pepsin. In several instances where the digestion of the cheesy matter was complete, the fat has appeared to be entirely digested and to have entered as fully into the constituency of the chyme as the nitrogenous matter itself.

In each case of artificial digestion, 100 grains of cheese were treated with 10 grains of Smith & Pitkin's saccharated pepsin extracted from the stomachs of swine, in 4 ounces of distilled water containing 24 drops of hydrochloric acid, the whole kept at blood heat and shaken and observed every 15 minutes or oftener until change ceased. I have constructed out of the experiments a table in which there is a brief description of each variety of cheese, treated with an analysis showing the water, fat, casein and ash it contained, with brief remarks upon the same.

In other cases, as in the important digestion of skim cheese, the fat is not only not acted on, but is not even separated from the cheesy matter at all. In regard to the first point it will be sufficient to refer to Nos. 11 and 12 in the list, No. 11 being a Young America, as it is called, a small factory cheese made in the usual way with an acid curd. In this the digestion was imperfect. The fat and cheesy matter were imperfectly separated, and a considerable of the latter came to the top with the fat, while another part of it separated and fell to the bottom. No. 12 was a sage cheese, the sage helping the airing along. It was well cured and appeared ripe, rich and old, though it had just about the same age as No. 11. It required but $1\frac{1}{4}$ hours to make a digestion that was perfectly natural and complete—leaving no loss whatever, while No. 11 required $3\frac{3}{4}$ hours to effect an imperfect digestion, and then left not less than 20 per cent. not acted on. For an illustration of the difference between skims and full cream cheese, compare Nos. 8 and 40, both about the same age. No. 8 is a half-skim, having over 20 per cent. of fat in which digestion stopped at three hours and forty-five minutes with $\frac{1}{5}$ of the casein only dissolved. No. 40 is an American Cheddar, full cream, in which the digestion of the whole cheese was complete in seventy five minutes.

In respect to the third point—the difference in the digestion of acid and no acid cheese, where other conditions were similar—the difference of digestion was always very plainly in favor of the no acid cheese. And as this point is one of great practical importance, it would be very interesting to trace it at some length, but it must suffice here to refer to Nos. 38 and 39 in il-

lustration of this matter. These two numbers were made in Dr. Wight's factory, and were from the same vat of milk, which was curded and worked in one vat till the whey was well separated. Then one-half of the curd and whey were dipped quickly into a separate vat which stood handy by, and which had been warmed ro receive it. The part so dipped out had the whey run off at once while it was sweet, and the curd left to drain and pack in the upper end of the vat, and was covered to keep it warm, and turned occasionally to keep all parts warm alike. When it would string on the hot iron an inch to an inch and a half, it was ground and pressed. The other remained in the vat, where it was made, until it responded distinctly to the hot iron, when it was put to press. Both were salted and treated alike, except that one was kept warm, and ripened out of the whey till the curd would spin on the hot iron, and the other was ripened in the whey till it would spin, and the whey became sour.

Both, after pressing, were kept in the same room and alike till they were about thirty days or a little more of age, when samples of each were taken for digestion. Being not yet properly cured the digestion was slow, and the no acid curd digested in three hours, the acid in three and a half. In the former 60 per cent. of the curd was dissolved ; when the action stopped in the latter, 30 per cent. In the former the fat was well acted on ; in the latter very little, and it contained 21 per cent. more than the former.

For a sample of the fourth point we may compare No. 6, in which the whey was not well separated, and which after four hours, digestion was still progressing slowly, but the fat and casein not sufficiently acted on to separate them, and both came to the top together, with Nos. 31 and 32, in which in less than half the time the whole substance of the cheese was changed to perfect chyme.

The following table gives the results of the analyses to which we have referred.

No.	DESCRIPTION.	Water.	Fat and Extract.	Casein.	Salts.	Pr. cent. digested	Time of digest'n H. M.	REMARKS.
1	Carumenbert; small French; about 4 oz.; soft, semi-fluid; resembles the French Brie. Pungent cheesy taste; apparently almost digested. N. Wernert & Co., New York.	50.41	20.55	23.49	3.52	.....	2.00	Change ended 1h. 45m. Digestion very perfect. Natural odor of human stomach.
2	Good American imitation of Brie; weighs 4 to 5 lbs.; consisting of Borden's condensed milk. N. Wernert & Co.	41.50	36.15	17.63	4.70	.....	2.00	Like No. 1.
3	American imitation of Neufchatel; soft Carumenbert; appears pickled with sharp acid; very small cheese. N. Wernert & Co.	37.45	34.60	24.04	3.90	.....	1.00	Digestion rapid but imperfect. Cheesy matter not much dissolved after 18 hours.
4	American imitation Pont L'Eveque; size 3 x 4½ x 1; rectangular; soft, delicious flavor.	26.02	50.80	20.64	2.54	.....	0.45	Nearly perfect. No change in 18 hours.
5	Pont L'Eveque; genuine; like above; but texture tough instead of short, as in 4; less cheesy taste and more acid, and like Limburg.	44.57	21.80	30.36	3 97	.....	4.00	Scum of casein spotted with yellow oil. Casein also precipitated. Not done in 4 hours. Smells of lactic acid. Otherwise natural.
6	Full cream; sharp and poor from excess of whey retained; acid make; Amer. Factory.	36.72	29.18	30.95	3.34	.....	4.00	Heavy scum of fat and casein. Not done in 4h.; 18 hours after, little change.
7	Philadelphia hand cheese; not rennet; sour skimmed milk; 3 to 4 ozs.	33.14	1.86	58.66	6.03	.....	4.00	Considerable cheesy sediment; not done in 4 hours; smells strongly of taint and acid.
8	Skim cheese; very porous and poor. Mr. Folsom.	35.31	20.36	39.26	4.79	.....	3.45	Curd mostly undissolved, with odor of cheese, and acid not much like digestion.
9	American imitation of English dairy, called fine and rich. Thurber.	27.95	36.04	36.76	5.24	.....	3.45	Tolerably well done, with dirty sediment.

No.	DESCRIPTION.	Water.	Fat and Extract.	Casein.	Salts.	Pr. cent. digested	Time digest'n H. M.	REMARKS.
10	American Cheddar; whey drawn at beginning of acid. G. F. Webb, Pa.	30.92	34.10	30.60	4.36	.....	1.00	Considerable scum of fat and cheesy matter, with coloring. Well done.
11	Young America; acid make. Thurber.	32.97	31.13	31.78	4.13	.. ..	3.45	Chyme turbid and dirty looking. Scum of fat and cheesy matter, heavy.
12	Sage cheese; mottled, very porous and soft; ripe, rich, and good flavored. People's Market, Syracuse.	32.32	28.62	33.32	4.23	.....	1.15	Digestion very complete.
13	Gondee; Holland; old and fine. N. Wernert & Co.	21.90	24.81	46.95	6.32	.....	2.00	Imperfectly done.
14	American Limburg; fine, with characteristic odor.	23.26	34.98	35.05	6.69	.....	2.15	Digestion good, but smells awfully.
15	American Limburg; 2d quality. Less Limburg and more cheesy odor. N. Wernert & Co.	35.65	30.85	27.57	5.91	.....	1.30	Well done.
16	Edam; Holland; nearly fine. N. Wernert & Co.	.....	.....	.. ...	.....	.....	3.45	Well done.
17	Edam; from Holland. Roethlisberger & Gerber.	.....	.....	.....	.....	.....	1.15	Not so well done; a slower digestion than above.
18	One-fourth skim from Illinois; summer made; fair goods.	26.72	32.65	36.16	4.46	..	3.45	Chyme dirty looking and turbid.
19	Edam; same as 16 and 17.	.....	.....	.....	.....	.....	3.45	This had 12 drops phosphoric acid added.
21	Sapsago; color green; known also as Krautzer kase: Swiss cheese without rennet; preserved with aromatics: not cheesy; 6 ozs.	13.30	15.52	57.59	13.57	.....	3.45	Large sediment of curd. Digestion imperfect.

No.	DESCRIPTION.	Water.	Fat and Extract.	Casein.	Salts.	Per ct. digested	Time of digest'n H. M.	REMARKS.
22	Leyden, or Comijn Kaas, from Holland; highly aromatic.	25.44	6.48	58.45	9.60	.....	3.30	Large sediment. Digestion imperfect.
23	Chester English: old and ripe: natural color. John H. De Witt.	.....	.....	.....	.....	.....	1.15	Nearly complete. Good.
24	Holland cheese: specific name not known: full cream, said to be, but probably half-skim; well flavored; rich appearing. John W. Witt.	.....	.....	.....	.....	.....	3.00	Considerable undissolved matter at top and bottom.
25	American factory; full cream. Geo. Habermann.	.....	.....	.....	.....	.....	3.30	Very complete.
26	Poor skim cheese; hard and dry; factory make.	33.15	2.08	58.94	5.14	....	4.50	No fat on surface. Smells of decay.
27	Factory cheese; fine appearing; sharp from retention of whey. G. Habermann.	32.86	33.90	.....	.....	.....	3.30	Fat acted on by pepsin. Digestion very complete.
28	Same as last, but appears poorer.	37.29	23.09	.....	.....	.....	3.45	Not quite so good as above.
29	Pineapple: supposed to be from L. W. Norton, Goshen, Ct.; not enough to analyze. G. H.	.....	.....	.....	.....	.....	4.30	Not done after four days. Seven-eighths of the curd dissolved.
30	American imitation Muenster; a German cheese; full of fine holes; curd sweet. N. W.	.....	.....	.....	.....	.....	2.00	Curd all dissolved.
31	Fine American dairy; old, dry and crumbly; cheesy flavor very full. A. C. & Co.	22.06	28.34	.....	.....	.....	1.00	Curd nearly all dissolved in twenty minutes. Some large lumps remained one hour.
32	Imitation English dairy; fine old. N. W.	25.44	34.45	35.35	4.50	.....	2.00	Complete.

No.	DESCRIPTION.	Water.	Fat and Extract.	Casein.	Salts.	Per ct. digested	Time of digest'n H. M.	REMARKS.
33	Factory half skim; resembles Switzer Kase in porosity. Syracuse.	32.36	20.13	.....	.....	.....	3.00	Curd all dissolved, but chyme not perfect. Milky,
34	Parmesan: Italian skimmed; seasoned with aromatic herbs.	23.02	12.49	55.85	8.14	.....	2.00	Chyme cloudy. Imperfect.
35	Roquefort: French; old. Wernert.	28.36	.....	.....	.....	.....	2.00	Perfect. Fat digested.
36	Roquefort; newer.	28.87	33.70	28.82	8.66	.....	2.15	Nearly perfect. Fat digested.
37	Factory cheese; fine, old; cheesy flavor very distinct. A. M. & Co.	21.02	39.46	33.61	5.62	.....	1.30	Nearly perfect.
38	Full cream Cheddar; no acid; young; from vat divided. Dr. L. L. Wight.	35.84	22.74	37.87	3.53	.....	3.00	Sixty per cent. of cheese dissolved. Fat well acted on.
39	Full cream; acid make; same as above; vat divided; worked unlike.	38.11	22.45	35.74	3.69	.....	3.30	Twenty to thirty per cent. of cheese dissolved. Fat little acted on.
40	Cheddared cheese, from store in Syracuse; fine cheese; flaky.	.....	.....	.....	.....	.....	1.15	All dissolved.
44	Imitation Switzer Kase. Syracuse.	38.51	24.84	32.08	4.57	.....	2.40	Four-fifths digested. Chyme clear.
45	Genuine Switzer Kase, or Gruyere. Syracuse.	48.60	21.29	23.58	6.52	.....	2.30	Similar to above; five-sixths dissolved.
46	Imitation Limburg. Syracuse.	.....	.....	.....	.....	.....	3.10	Four-fifths dissolved.
47	Imitation Limburg. Another cheese.	35.05	32.18	27.93	4.82	.....	2.20	Very little sediment.
48	Gruyere; genuine; imported: old. Syracuse.	28.35	29.16	36.60	5.89	.....	1.30	Chyme very clear.
49	Full cream dairy cheese. Syracuse.	35.93	27.18	32.85	4.03	.....	2.10	Thick layer of oil on top. Chyme nice. Little sediment.
50	Sapsago, or Krautzer Kase; small green cheese; 6 ozs. Syracuse.	27.51	6.17	53.63	12.92	.....	3.30	Poorly digested. Large sediment.

Proceedings and Discussions.

Tuesday, January 14.

The Assistant Secretary, T. D. Curtis, called the association to order, Tuesday, at 11 A. M., as follows:

"Gentlemen of the American Dairymen's Association: It is now after time for the convention to assemble; I therefore call you to order and call Vice President Dr. L. L. Wight to the chair."

Mr. Curtis then said: On account of the small attendance, he thought it would be injudicious to appoint any committees, with the exception of one on the order of business.

On motion of J. V. H. Scovill, the chair appointed as such committee, Messrs. J. V. H. Scovill, J. F. Joyce, E. G. Ellis, Josiah Shull, and W. L. Rutherford. The other committees were to be announced at the discretion of the chair.

On motion of Hon. Josiah Shull, Mr. T. D. Curtis was added to the committee.

Adjourned to 2 P. M.

Tuesday Afternoon.

On assembling at the appointed time, it being the desire of leading dairymen to attend the meeting of the International Dairy Fair Committee at the Butterfield House, and that a recess for this purpose be taken until evening, Mr. Curtis put the question to vote, and it was unanimously carried.

A recess was then taken till 7 P. M.

Tuesday Evening.

Hon. Josiah Shull was called to the chair at 7:30.

Mr. T. D. Curtis then read a paper on "Profit and Loss in Dairying."

Mr. Van. Duzer—While we concur in general with the paper and its teachings, I, for one protest against the argument which seems to be gaining ground and popularity, that all profit lies in small farms and that there is no profit in large ones. It does not satisfy me that a one-acre farm will produce $100, while a 1,000 acre will produce only five or six dollars an acre. There is not this difference in the size of the farm; it is the difference in the amount of the labor put upon the acre, and the character of the crop produced. This seems to me to be an unnecessary argument to bring against large

farms, for with similar cultivation, the farmer who is tilling the small dairy farm finds it no more profitable than the dairy farmer who, with equal care and management, is tilling the large farm. The large farmer who conducts his business on a system, with the necessary help about the place, can manage his business as well as the small farmer, and as cheaply and satisfactorially, and with as good profits, where the management is equal, and the cultivation as good.

Mr. Curtis—I agree with Mr. Van Duzer. I used the extreme illustrations simply as an argument in favor of the importance of thorough culture.

Mr. Van Duzer—But that doesn't entirely meet the case. Of course I accept it as sound teaching in the case where a man's farm is large, and he can't cultivate it properly, or he lacks capacity to manage a large farm; then he should have a small farm. But if a man has a capacity to manage a large farm, there is no reason why he cannot make it pay as well to the acre as a small one.

Mr. Hibbard—I made the remark to-day, that I believed most of these essays shoot over the head of the average farmer, just as that criticism which we have heard here to-night, that advocates extreme and radical changes which the farmers of this country will not allow. Most of them will not. For instance, reducing the dairy one-half; farms reduced to the size of one acre or to gardens. But here comes the question of production, and it is with that we must have to do. Here I am making an unmarketable butter; how shall I make it marketable? My butter is rancid when it goes to market; how shall I make it sweet? Take the farmer with the large farm, poorly cultivated, with some of his cows poor and some good, more or less, and tell him what to do just as he is, without any great radical change, then you can reach the average farmer.

Mr. Hawley—Allow me a single remark, in the way of backing up what Mr. Curtis said, from practical experience. I have a brother-in-law who had a 400 acre farm, and he had on it a large flock of sheep, some horses and forty cows, with other stock. He found that he was not getting over large yields from his 40 cows, so he went to selling off some and selecting throughout the country the best he could find, and within three years he made more butter from 14 cows than he had made from the 40.

Mr. Curtis—I used the extreme illustrations. I was getting at the statement that it does not pay to keep cows that do not give annually 5,000 pounds of milk. They barely pay for their keeping; that is all.

Mr. Van Duzer—I would like to hear from the dairymen upon the two criticisms made, and that is, that there is no profit in a cow unless she produces 5,000 pounds of milk, and the

other, that under the present prices it costs $37.50 to support a cow. And then there is another point. He proposed to reduce the cost of keep by one-half when they sold off the cows, and still make the other one half produce three-fourths as much as all. Now you can't do that unless you give more than one-half the food. We have got to estimate more than the cost of one-half the food. I want the experience of others here upon this subject, who have the figures to prove what is the cost of keeping a cow upon the present prices of hay and grain, and whether there is any profit at anything less than 5,000 pounds of milk.

Mr. Hawley—There can be no standing rule that will apply in this case. Again, the cost of keeping varies with the price of lands. In this city lands are worth $150 to $200 per acre, and less, as you recede from the city. In Syracuse, land is worth $500 an acre, and stretching back a few miles it will bring about $200 an acre. How much does it take to keep cows on these lands? And if you will estimate the interest money upon the number of acres, position, hay and feed, all in all, it will amount pretty well up towards $37.50, and with other things taken into consideration, with interest on cows and stock and hired help, that estimate of $37.50 is plenty small enough.

Mr. Van Duzer—If you don't keep cows, you can produce hay and grain and sell it. Now, what is a fair estimate of the cost of keeping a cow during the year? What can be regarded as such. The cost of the hay can be easily estimated, and I will maintain at the present prices of hay and grain, that $37.50 is too high an estimate for the keeping of a cow for a year.

Mr. Curtis—How many tons of hay will a cow eat for the winter—during the foddering season?

Mr. Van Duzer—I should say she would eat if she had been giving milk, about three tons.

Mr. C.—What is hay worth a ton?

Mr. Van D.—Say $6 a ton.

Mr. C.—This is $18. Now then, how much during the summer, equally as much?

Mr. Van D.—No, sir.

Mr. C.—It isn't worth as much to keep a cow during the summer, as it is in the winter?

Mr Van D.—No, sir, because in the pasture she gathers for herself, and hay you have got to gather for her.

Mr. Curtis—I never could get a cow pastured for less than $15 to $20. Suppose it costs as much through the summer as through the winter, you have got $36

Mr. Van Duzer—It isn't fair to take the prices you have taken for pasture. I don't say they are not right, but I want to hear from those men who have careful statements in this regard.

Mr. Lewis—Mr. Chairman, I don't think that Mr. Curtis has placed the cost of keeping a cow too high. I think it is very

low. I think he must count in the interest on the money invested in the cow, and that is about 17 per cent. per annum. The depreciation of the cow by age, her liability to accident, and the length of time you can use her as a milch cow, the money amounts to about 17 per cent., and this must be added to the cost of her keeping.

Mr. Baker—I believe the statement made by the honorable Mr. Curtis may be correct for New York, but I think in the West we can keep cows much cheaper, and that is the great trouble in the West, in making butter and cheese. This is because by the cheapness of the feed there, we can keep cows at less than one-half the expense estimated by Mr. Curtis.

Mr. Chadwick—I think some cows can be kept at a profit, if they don't give 5,000 pounds of milk per year. I know of cows, of whose milk it did not take 20 pounds to make a pound of butter. In regard to the cost of keeping a cow, down in Chenango county, we can't get six dollars a ton for hay in the barn. There is lots of hay there that is sold for five dollars a ton in the barn, and it is generally estimated that they don't give a cow more than two tons of hay in the winter. I don't know as Mr. Curtis' figures are any too high, but the different localities make a great difference in the cost of keeping cows. Now if he would drive his cows down on to my farm, and give me twenty dollars a head for the summer, I would keep no cows of my own, and think I would make money then. Men living near villages and cities have to pay high prices for keeping cows, and milk and butter is generally higher priced when we get nearer the city; and I am of the opinion that there may be some profit in keeping some cows, even if they don't give us more than 4,000 pounds of milk.

Mr. Van Duzer—My estimate of three tons of hay is a general one, but intended to cover roots and grain, and keep the cow in good order. Two tons of hay fed in connection with the other foods, is ample for keeping a cow in the stable for six months.

Mr. W. L. Rutherford, of St. Lawrence county, then read a paper on "Jerseys for the Dairy."

Mr. Hoxie—While admiring the Jersey, I think I shall take exception to two positions taken by Mr. Rutherford. One is, that a cow necessarily gives rich milk, because she gives a small quantity. Now I think that impression may be universal, but as far as my observation goes, it is not true. In my own case, for the last three years, I have found that the cow that gave the poorest milk, gave the least in quantity. I find it so wherever I have looked into the case. I have no way of explaining it, except this: When a cow begins to take on fat, she loses in milk, and the milk loses in richness. It seems that this is a good reason, and it looks as if it might be true. You

take a cow when she begins to take on flesh, and her food goes mainly to flesh: she not only decreases in the quantity, but in the quality of her milk. So I don't think it is a universal rule, that the smaller the quantity, the richer the milk. It is not a rule. The other position which I would take exception to, is in reference to cows that must necessarily be poor beef cows, because they are good milch cows. I think this is a poor rule. The beef animal depends on where the fat is put, for one thing. The poor beef animal puts the beef around the intestines and kidneys, while the good beef animal puts it among the muscles. That is the difference between the good and the poor beef animal. Now this fat, which is stored in the system, when you begin to milk a cow, if she is a good milker, she will put into the milk, and begin to grow poor. The fat is put into the milk. So the great point is to see that an animal is a good milker, and that she is a good beef creature, and puts the fat on in the right places.

Mr. Rutherford—The remarks of the gentleman don't apply to Jerseys. They never take on fat in different parts of the system, but put it around the kidneys. It would be all correct if the cows that take on fat in the other parts would turn it into milk. As a rule, I think, I find they don't. The cow that deposits her fat inside will produce the best quality of milk. As a rule, the cow that readily puts fat on the outside and among the muscles is not a proper cow for milk. That has been my experience; but, then, we are not all of the same mind.

Mr Scovill—It seems to me that this is a very important consideration, if it is a fact, and I don't see why it doesn't follow, from natural causes, that the smaller breeds of cows, like the Jersey, which seem to be excellent producers of butter, are not very much easier to be kept than the larger breeds of cows. And it seems to me that here is one important point in the profit of our dairies: Is there a smaller amount of food required to keep the cow of medium size, rather than the very large breeds of cows? Have we any data whereby we can ascertain whether there is very much difference between the small cows and the medium or very large ones in actual keep.

Mr. Curtis suggested that as Mr. Hoxie had a paper to read next on this subject, he should be allowed to go on with it, discussion to follow that. Agreed to.

Mr. Scovill moved that when the association should take a recess it should be till 10 o'clock A. M. Carried.

Mr. Curtis from the Committee on the Order of Business reported the programme for the remainder of the session.

Mr. Hoxie then read a paper, "Holsteins for the Dairy." (See page 29.)

Mr. Hawley—We frequently hear of men getting vastly rich on paper and in figures, but I never knew of a man realizing one-tenth part of what he could figure out; and I am a little inclined to think that he can never realize two pounds of butter a day on an average from a single cow. I don't wish to run down any grade of cattle, but we had a full blooded Ayrshire and Holstein, and they never could come up to a half blooded Jersey that we owned.

Mr. Shull—Mr. Hoxie, allow me to inquire if you can inform us how much these cows consume a day, or week, or year, to bring about these wonderful results you have told us about?

Mr. Hoxie—The results that I have adduced were mainly drawn from what I supposed to be well proven statements from those like Prof. Hengweld, and from experiments tried in Europe, England, Holland and this country. Col. Hawthorne states he has tried the Holsteins side by side with his other cows, and has always succeeded in producing larger amounts from the Holsteins. Mr. Bingham, of Rome, who has recently visited Europe, said to me last week that there was no question in regard to the superiority of the cattle of North Holland. I find it so in other parts of the country. I know of several that have told me they have got one-third more from the Holsteins than from others. Dairymen who sell milk in the city of Syracuse tell me the same thing. So far as feed is concerned I know of a gentleman who, although he was obliged to feed some grain, had 15 cows and a bull and a lot of calves on his farm, and he only cultivates 39 acres of land. A man must judge he had to feed some grain. But he has kept eleven cows on the 39 acres, and not fed any grain till the latter part of the season. They fed on grass alone. One of them gave for a considerable period a daily average of 76 pounds; her highest day's record was over 90 pounds. I know these figures seem wonderfully extravagant. Dr. Bingham visited a man in Holland who on 120 acres kept 32 cows, eight of them two-year old heifers, and seven of them three-year old heifers. The rest were full milch cows, and the day he was there, the 6th of September, they averaged 17 quarts a day. The best cow would average about 15,000 pounds for a year. And, further, he told me that he got the bottom facts in regard to them. Prof. Roberts thinks they make better beef than the Shorthorns. The bone is fine, for animals of their size. This is one of the points in the selection of a cow; she should be fine boned for her size.

Mr. Hawley—In relation to beef, I have a question which may be of some benefit for us to think about. I have been eating this Western beef, and I have got almost sick at the sight of beef. What is the reason? Isn't it because it comes such a long distance that it loses the sweetness which the beef

has when killed off from our pastures? I think we farmers will have to take these cattle when they arrive and put them on our farms and sweeten them up before they are killed. In relation to this milk business, I have this remark to make, that I have seen the Shorthorn grades and milked them myself, filling a 16 quart pail running over, and then have had to get another pail besides, twice a day, throughout the season.

Mr. Scovill—I don't propose to tell any large stories, but I would like to call on Mr. Hazard, of Pennsylvania, a gentleman of large experience, who has made some experiments with the Holstein cattle

Mr. Hazard—I have never experimented much in the Holstein breed, or enough to get at any satisfactory results. Mr. Christian has been carrying on the experiments for the last eight years in the Pennsylvania Agricultural College. He has had two farms under his charge, but of course he could not do much with a $1,000 for each. Both farms are languishing, and the experiments have not been carried on as well as they should. The college has got into debt, and we have had to ask the Legislature for $8,000 the last year, and next year we shall apply to the Legislature to have it abolished. The farms are self-sustaining. Still, the extra money was required to carry out a large number of experiments that we have had to undertake in view of the demands of agriculture.

Mr. Hoxie—Some three or four years ago I was invited to read some statements at Elmira before the State Convention. After I had read these statements, some one made the same remarks as have been made here to-night. Prof. Arnold sat back behind a table. "I have come to the conclusion," said he, "that the value of a cow is determined by what she eats and what proportion she gives back through the pail." This is just my experience. The cow that eats the most and gives it back in milk is the best cow. The cow that will eat everything, and all that you put before her, and give it back in proportionately larger quantities of milk, is the best cow for the dairy.

Mr. Hardin—Then, according to your theory, an elephant weighing 13,000 or 14,000 pounds, and which would eat from three to four hundred pounds of food in a day, should make three or four hundred pounds of butter, while a goat, weighing one hundred pounds, isn't much good. Now I think, as a rule, an animal will eat in proportion to its size. The cow, weighing 1,600 pounds, will eat just about twice as much as a cow weighing 800 pounds. That has been my experience. I have carried out the theory in that table, where, you will remember, the Holstein is set down at 350 pounds of butter, while the Jersey cows run up to 281 pounds of butter. A Jersey will weigh about 800 pounds, while a Holstein will average 1,300

pounds. Now if a Jersey weighs 800 pounds, and she gives 281 pounds of butter, then she gives 35 pounds of butter to 100 pounds of live weight, or 703 pounds of milk to 100 pounds of live weight. If we take the Holsteins at 1,300 pounds, and she makes 350 pounds of butter, she only gives 26 pounds of butter to 100 pounds of live weight, and only 674 pounds of milk to 100 pounds of live weight, as against the Jersey's 703 pounds of milk to 100 pounds of live weight. Since I have been in the city I have had a large number of gentlemen apply to raise the question, whether we can't get up some test, and we have agreed to meet to-morrow morning, at Bagg's Hotel, and have a talk over the thing, and see if we can't agree on some sort of a record by which we can determine wherein one breed of cows has the preference over the others.

Mr. Hoxie—The gentleman saw the fallacy of his argument before he sat down. Now, he probably knows how much more a cow will eat when she is milking. He probably knows she will eat double the amount of food, when she is giving milk that she will when she is'nt; she eats double and treble. And it is just so in regard to the large cow and the small cow. The cow doesn't eat just in proportion to her size, but in proportion to what she gives, and the fat she puts on.

Mr. VanDuzer—If that is so, what difference does it make whether she gives 3 or 33 quarts of milk?

Mr. Hoxie—They don't eat in proportion to their weight.

Mr. Hardin—Suppose we take this question of food up, for a little time. How much do you think a cow will eat and drink in a day? Well, if you will carry it along to a summer's day, I will guarantee, that it will be 200 pounds, and she will give from 15 to 20 pounds of milk. Now, have we got to find a cow eating in this ferocious manner to give a little more milk? No, my experience goes against it. My impression is that the yield of milk has very little to do with it.

Mr. Hoxie—As a rule, the cow that eats the most will produce the most from the food.

Wednesday Morning, January 15.

Mr. Curtis called the meeting to order, at 10.30, and Prof. G. C. Caldwell took the chair.

Mr. Scovill, then read his paper on "The Lessons of the Census." (See page 112).

Prof. Lazenby, of Cornell University, next presented his essay on "Principles of Feeding." (See page 47).

Mr. Bonfoy—This subject is evidently of great interest among stock feeders and dairymen, especially as to the relative value of root and grain feeding. There is quite a difference of opin-

ion in relation to the advantages and merits of the two kinds of food. Many of the dairymen are turning their attention very generally to the raising of roots, while others depend upon the principle of feeding that has been presented in this paper. I would like to get the opinion of experienced gentlemen on this point, as I think it will be appreciated by stock-feeders generally.

Mr. Cole—I have had very little experience for a few years; but I find by cutting grass somewhat earlier than the generality of people do, and rendering the hay as nearly like grass as possible, we succeed as well as in any other way.

Mr. Curtis—Do you feed roots?

Mr. Cole—Not as a rule, no Sir.

Mr. Curtis—Grain?

Mr. Cole—Some grain.

Mr. Fish—It is hard for me to keep my mouth shut on an occasion like this, as I have a deep interest in the progress of dairying, and I have looked into this matter of feeding, some, myself—feeding different kinds of food to animals for different purposes. Now, in my limited observations I have found that all kinds of food are not adapted to one specific purpose. Animals for different uses and for different purposes, and calculated to reach different results, require different feed and different care. The specific and alloted purpose of the plant is to prepare certain substances and certain material for the animal. We all know that the animal couldn't subsist without a proper proportion of the different elements of food in its physical organism. It is a great point, for the growth and development of the plant is to prepare its physical and mechanical system for the animal, and men feed the animal to produce different purposes, and specific results. That looks to me to be an important point for all farmers to consider and experiment upon. But I hope the gentlemen who have the ability and experience, will speak upon the subject, and I feel that if in the future they will investigate the relation between plant and animal, they will find it important to experiment upon.

Mr. Bonfoy—There is one thought that I have overlooked, and that is the wants of our stock in the winter, and whether they are best satisfied with roots or grain. It is an important point which every dairyman should ascertain in the course of his own experience, and become satisfied with. In my own experience, I have come to this conclusion. Formerly I used roots, various kinds of roots, and latterly roots and meal, for winter feeding. And I gather from the paper that has been read here, as well as my own experience, that animals are better satisfied with grain than with roots. That is my conclusion.

Mr. Brown—I don't feel competent to say anything for the interest of the dairymen to enlighten the convention, but I have

a deep interest in dairying, and it has been my business from a boy up. It appears to me from what little experience I have had, that there is nothing for winter feed for cows equal to dried grass. I notice that my dairy when they get out in the Spring, after the grass has become sweet, do better perhaps, than at any other season of the year. So I mow my hay and get it into the barns a little earlier in the season. I commenced years ago to harvest my hay crop before my neighbors did, for I observed I had better results from feeding this early cut grass, and from mowing the second crop, and putting it all in the barn in good condition, so that it would not heat, but retain that freshness. And I notice furthermore, that a mow filled with early cut hay goes much farther than ripe hay. It not only lasts much longer, but it produces better results in milk, and is much more satisfactory where good beef is desired. In regard to feeding other foods, my plan has been to feed grain. There was one point brought out in the paper that was truly, as I believe, to the advantage of dairymen; that is, that rich food makes more milk—that we produce better results in butter than by feeding oats and wheat bran. I had supposed from what experience I had had upon the subject, that if I wanted to get the best results in butter, or to increase the flow of milk, I must feed those rich foods. But I think I have found that in my dairy, wheat bran and oats will do it better than grain. Still, if the theory advocated in the paper be correct, and we presume it is so far as scientific principles are concerned, it is something we would be glad to know.

Mr. Bonfoy—I once made an experiment, that of preparing grain with shorts to feed; and the result was an increase, both in flesh and the flow of milk. My experience in feeding shorts has not been in accordance with many dairymen's views.

Mr. Lazenby—Perhaps on this point, I did not make myself sufficiently clear. I wish to state that it was the theory of most scientists, and generally a theory without practice or experiment, that any food containing a large amount of oil would produce a larger proportion of butter, than other foods. But this has been found not to be true, for, although there is, perhaps, a slight change produced in the amount of butter, in feeding such foods as this, it is very slight indeed, and a great many experimenters have maintained that they could not change the different proportions of the constituents in milk by any system of feed. That is, what they would feed to a certain cow, to produce the best results in butter, they would feed to the same cow to produce the best results in cheese. The qualities of the cow are mainly inherited, and cannot be changed by feed.

Mr. Fish—I find in experimenting and feeding cows, that the nearer like the milk is the food when given, the greater is the

flow of milk—as if upon the principle, that less labor is required for the physical preparation of the food by the animal to convert it into milk. Therefore I fed grain in the milk, or green grain, from the idea that it was nearer like milk, at that state of its growth than at any other period. One season when experimenting with different kinds of food, I produced from a cow 7,846 pounds of milk in the season of cheese, not counting in the butter made.

Prof. Caldwell—I was going to say, in regard to one or two remarks that have been made, that they show very clearly that as grasses grow older, the proportion of nutritive matter diminishes steadily, and the digestibility of the nutritive matter diminishes. So that a pound of grass when cut very early will go farther than a pound of grass cut when it is very ripe. This corresponds with the statements made by some of the gentlemen present. Our own experiments have been performed with grasses in various stages of growth, and they demonstrate nothing more than that. But as to the use of grass for the production of uncommon quantities of milk, and a larger production generally, I think no experiments have been made; but it is clearly shown that, if it were not for the labor of harvesting the grass when it is two inches high, it would be better to cut it then. But you have got to wait as long as you can, so as not to have too great labor in harvesting the grass.

Mr. Curtis—Do you want to cut corn at the same stage of growth as you would grass?

Prof. Caldwell—I understand the same in regard to corn as I do in regard to grass. As corn grows, it keeps on increasing in amount of matter and in the quality of the crop. I have always understood that the younger the grain, the more digestible it is. And now I would like to say a word in regard to the use of roots. Dairymen, I think, have often found it beneficial to feed roots. There may be some choice, of course, as to the kind of root, and I would say that parsnips have been used by us a little, and it is quite remarkable to note the amount of nutritive matter there is in a parsnip. Besides the parsnip, I would also recommend for food the beet and mangle wurzel. These are better than too much grain, but I hold that the parsnip is better than either.

Mr. Fish—We have different views of course upon these points, and pointing out these differences leads to the development of ideas and benefits us. I would say, in regard to corn in its early growth, it is composed of coarse material. It takes root more rapidly than any other plant. In its early stage, it is a cathartic, and because of that property, it is unfit to eat. I have always rejected it, and am looking into the practices of my neighbors in feeding what they call fodder corn. I find it

is generally injurious, for the reason that they commence feeding it too young. That is to say, it has not had the benefit of enough light and air, and it is not properly matured. The saccharine juice is not properly developed. My idea is, that it should be grown to a certain stage of maturity, or till it gets nearly its full growth. I don't mean to say that it should be allowed to grow a large amount of woody fibre, but the saccharine juice should be fully developed. At the stage when it is fully in blossom, and nature is making her greatest effort to develop the fruit, is the proper time.

Mr. Purvis—I have fed fodder corn many years to my dairy, and my experience agrees with Mr. Fish's, that it is not a very good article to feed till about the stage of blossoming. And in regard to feeding, I have dispensed for the last two seasons with grain, and used early cut hay with good success, and I think it should be the main dependence of dairymen.

Mr. Bonfoy—I have fed fodder corn a good while, but never in very large amounts. My experience and observation correspond very fully with Prof. Caldwell's.

On motion of Mr. Curtis, the Association took a recess till 2 o'clock P. M.

Wednesday Afternoon.

On reconvening, Mr. A. A. Hopkins, of the *Rural Home*, was called to the chair.

Assistant Secretary Curtis, then read a paper, by Dr. L. L. Wight, on "Marketing Cheese." (See page 44).

Col. Crocker—I don't see why the price of farm products should be fixed by the buyer instead of the seller. Our county is a butter county, and I struck out on my own hook and manufactured cheese. I have made my own prices, and I have been able to sell without the aid of buyers, or without even sending my products to New York or Philadelphia, or anywhere else. Now, then, it seems that any one—I don't know as a factory could do it—but I am well satisfied from my own experience that a man can make his own cheese at home and can make his own prices and sell his own products without any foreign aid whatever. Now this is my condition exactly. The best cheese I am sending to the city of New York and receiving eight cents a pound for it, and I have never, in any season, sold below the market price for the best factory. I am selling now, every day, my cheese at my home, and upon orders. I have shown my cheese and endeavored to get it before the public, and am now selling—and have been since last June—my cheese at nine cents per pound. I cut some cheese up, and sold it to my neighbors for miles around, at twelve cents

per pound, while there is a factory below me which is selling its make at six. Still, I don't know as every one could do this business, but I wouldn't patronize a cheese factory if it was within a quarter of a mile of me.

Mr. J. M. Peters—Does the cheese you sell on orders go to New York or other large markets, or is it taken by general dealers?

Col. C.—By farmers generally. At the Elmira fair three years ago, although I took no premium, I showed my cheese, and took several orders, one from an Orange county farmer. I sold one cheese to him for twelve cents per pound, which was above the highest price for the finest grade of factory cheese. At the next year's fair he ordered four. His neighbors had got a taste of it, and wanted some. The third year I sold him twelve, and this year he has already ordered ten. I have a number of that kind of orders in other localities. It all goes directly to consumers and into families.

Mr. Peters—I don't know whether the gentleman pretended to argue against the cheese factory system, and if he does, I think it won't hold, but still Mr. Crocker is a good man for the dairy business. I do not think that all the products of the State of New York could be turned into this channel, yet, a great deal more of it might be. Perhaps, if more of our dairymen would follow the example of this gentleman, it would be a good thing for their products. Before the conventions where I have had the honor to read papers, I have urged the practice upon the people of introducing our cheese to the home trade.

Mr. Crocker—My success is perhaps due in part, to the fact that it is generally known among my patrons that I do not allow a skimmer to be used about my premises.

Mr. Batchelor—I have listened very attentively to the paper read by the Secretary, from the pen of Dr. Wight, and to my mind it is a very excellent paper. I have also listened, with my mouth watering, to my friend from Binghamton, and I would like to have him send me one of his fine cheeses. I find it difficult for me to get cheese, such as I like to eat. Now, in his paper Dr. Wight says, "It is admitted that at present the finest qualities of cheese in England outrank our finest qualities by at least three-eights of their market value. When the finest American cheese will bring fifty shillings per one hundred and twelve pounds on the English market, the best qualities of their own production will readily command eighty shillings." Well, that may be so, and then you can go over on to the Continent and find cheese, the products of the French dairies, far above the English, while down in Italy the fine Parmesan cheese is outselling the others. So I believe that herbage upon which the animals are fed has something to do with

the quality of the products, and it is not, in this country, as select as it should be. I don't suppose in all England there are cleaner grass lands than are to be found in Cheshire, while cattle browse here on whatsoever they find, and there is no doubt in my mind but what the flavor and savor of the cheese is either improved or contaminated, as the case may be, whether or not the grass be clean and sweet, on which the animals feed.

In this connection I could quote from the poet Stedman, who says:

"The milder schweitzer hath a flavor,
Of marjoram and mountain thyme—
An odoriferous alpine savor--
You almost hear the cow bells chime."

This I know to be true, as I fancy I know something about good cheese myself. I had on my table for dinner to-day some cheese that came across the water, and the friend that sent it to me sent me one the other day. I returned it to him, and asked what kind of a cheese it was. "Why," he replied, "that is an Edam cheese." I told him I thought so, for I wouldn't give a damn for it. [Laughter.] So he sent me another, and that is excellent. And, sir, these Edam and other cheeses that are brought to this country, that hold their goodness from the first cutting till the last next to the rind, have an excellence arising from the manufacturing.

Now this celebrated Parmesan cheese is named from Parma, Italy, and the animals there are fed exclusively on "Lolium Italian," or the Italian rye grass. The fields are kept in an uncommon state of cleanliness, which is indeed observed in all the lands, and the people there are as frightened at the sight of a weed as we used to be at the sight of an Abolitionist. But, thank God, that is all over. I used to be one myself.

Mr. J. M. Peters, of New York, next entertained the Association by reading his paper on the "Commercial Aspects of the Dairy." [See end of proceedings, where it will be found, because accidentally left out of the proper place.]

Mr. Muller—I wish to ask a question. I don't know but it is an ethical question, but I propose to bring it up here and discuss it here. It is the relation between the Eastern and the Western tradesman. Now, take the case, where I send my butter and cheese to the commission merchant in New York. The Eastern man having the percentage makes out a bill of sale and a receipt for the percentage. Now, I don't intend to call into question the honesty of any particular class of men. I know that in every class there are honorable gentlemen, and I also know that every class contains dishonest men. The question I ask here is whether that bill is a just and fair statement between the man who sells my butter and cheese, and myself.

It may be honest, and it may be dishonest; how am I to know which? Isn't it fair, therefore, that every man should put upon his bill the name of the man to whom that butter was sold, that I may be able to trace out and to know that he has done my business honorably or not. Please bear in mind that I am not calling in question the honor of any man. I am not saying but what the commission men are just as honest as any class of men in the world that are doing business. Then I wish to ask another question. For instance, there is a merchant who has got my butter and sold it and collected the money and failed to return it to me. Now he makes an assignment of his goods, and I am classed among his creditors and share in his assets. Am I to share in common, and in the same ratio with another man who has sold his butter to this merchant for a certain price? He has converted my money to his private use, while in the case of the other man he has bought his butter and agreed to pay, and is owing him an honest debt. Now, under the laws of the State of New York, I want to ascertain whether I am to share as one of his creditors? I know it ought to be that a dairyman should have a right and a just claim upon the Legislature of the State to make him a preferred creditor in that case, and that I should receive my money if that man has failed in business and made an assignment, before the man to whom he is owing the just debt. Supposing I send a man into a bank to draw a thousand dollars for me, and he converts it to his own use. Of course it is called "embezzlement," and I can imprison him. What is the difference between the embezzler and the commission merchant in the case I have cited? I ask this question from the idea that this gentleman's paper suggested to my mind, and I thought it was a proper question to ask him.

Mr. Peters—I don't know of any way the assignor can compel his merchant to do as he requires, in the first part of his remarks, unless he does it by private arrangement. It would be a very difficult matter, and entail a great deal of extra bookkeeping upon a house to give all those facts. But in the commission business of to-day, with which I am familiar, it has been necessary to trust more or less to the honor of my associates. I don't see any method of removing these difficulties except by trust. If there is, it should be done. As to the right of the assignor to be a preferred creditor, it strikes me that it is a very reasonable proposition. I don't know about the law that regulates this matter, but it should be talked up. I think under the circumstances, where the assignor is cheated out of his money, he should be a preferred creditor.

Next came a paper on "Grasses," by Prof. Albert H. Chester. (See page 66.)

The next paper was on "Salt in the Animal Economy and as a Fertilizer," by Dr. Francis E. Engelhardt. (See page 94.)

Mr. Scovill—I would like to ask of the Professor, Mr. Chairman, how much of the salt which you make at the salt factories in Syracuse is advantageous to be used on an acre?

Prof. Engelhardt—Four to eight bushels to the acre, according to the land.

Mr. VanDuzer—Knowing that we have with us this afternoon a number of commission men of New York, I should like to ask their opinion more especially as to what the New York State dairymen will have to do to keep their wares upon the markets, and get the most out of the product of butter from their dairies, having reference to the fact that the Eastern men are making more butter than they sell in the summer which they put upon the market in firkins in winter. Merchants are now selling summer butter at 1 and $1\frac{1}{2}$ cents below the fresh butter coming from the West. The question is, are not we making too little butter in the spring and fall, and too much in the summer to successfully compete with the Western dairymen?

Mr. Curtis suggested that the Association hear the next paper before the discussion was continued. Agreed to.

The next paper was on "Shorthorns for the Dairy," by Hon. Harris Lewis. (See page 74.)

Mr. VanDuzer—I would like to hear the expressions of some gentlemen on my question.

Mr. Hoxie—I will repeat Mr. VanDuzer's question, which is, whether our New York State butter-makers are not making a mistake, in making butter in the summer season, and packing it in firkins to be marketed in winter, in competition with the Western fresh made butter, as there seems to be a growing demand for fresh butter the year round?

Mr. Douglass—You will all agree with me that the commission men and merchants of New York city are a very modest set of people, when they come into the presence of their great constituency. In fact, they naturally are of a very retiring disposition, and I suppose that is the reason why we all keep so quiet. I am not accustomed to making speeches, and I pray that the indulgence of this Convention may be given me, while I make a few remarks. This question that has been broached by this gentleman is one that has been attracting considerable attention in New York, for the past two or three winters. The Western people have discovered the importance of supplying the market with goods that are palatable, that are fresh, and that will sell; and with goods with which no one can find fault. They have discovered the method in which to do this, and they have succeeded to the satisfaction of all who use their goods.

They have succeeded to their own satisfaction, because their goods sell at an increased value, and that, I take it, is the mark aimed at by dairymen and by these conventions. Recently the "State Butter" or the "New York State Butter," as it is sometimes called, arrived in the market, as usual, late in the season, showing that the old system of holding dairies till the fall of the year, is entirely inexpedient, and the great question, to-day is, how shall the dairymen of this State enter into competition with those Western dairymen who fill the market with fresh goods? We see what has been done through the introduction of the associated power in the cheese factories, and so far as I have had any expression from the trade, it has been in that direction—that it is necessary for the dairymen to associate, put their milk together and manufacture it into butter in creameries. We all know when the creamery system was established, great fault was found with the quality of butter. Some fault has been found all along with dairy butter, but creamery butter has been found sweet and hard and fresh, and these qualities are what the state dairymen must seek to obtain. Here is one point in the trade, and there is the rest of the trade of the United States. During the war, and previous to the war, and after the war, we had no export trade for butter—no export which could be called export in a commercial sense. It was small. Butter sent East, found its way to a few outside markets—very slowly to the great population of Europe. Now they are beginning to show a want for this fine butter, and there is a very great demand for the right kind, and we have the markets of the world before us. They will not take goods that are old; although they may be sound, perfectly sound, they will not take them. To-day, dairies are being sold in New York, and the older tubs must be marked and indicated, because they can't be sold with the fresher butter. Now, it is evident that the farmers in this State can't compete with the Western farmers by feeding grain, so far are they removed from the sources of grain. Then the only remedy is the association of farmers, and the manufacture of butter in creameries, so that it may be forwarded in larger quantities and of uniform quality, to be sent abroad. This is the only thing to be done, and it is of the highest importance to dairymen, in this State, in Delaware, and in other States. But there is nothing to prevent the dairymen of this State, who intend to compete with their Western brethren in the manufacture of butter, from associating together and supplying all summer, uniform, fresh grass butter to the Eastern and Southern markets. Last summer, butter brought 18 cents. Now, what do we see to-day, in the New York market? Dairies are selling from 12 to 15 cents per pound, while a very few dairies are bringing upwards

of 18 cents. This enormous quantity of butter is on the market, good and bad together, cooped up in a small space. And now, appealing to the common sense of the gentlemen before me, I ask, wouldn't it be better if these goods had been put upon the market in season and condition to save the enormous differences between the two prices? You can raise the price of butter, the same as you do of cheese, and get rid of it when you can, the same as you do with your cheese. This is the moral, you must make the market, and then you must make good goods to supply that market; and in the end you will obtain very much larger prices than under the present system. You are losing to-day, and will continue to lose in this State. The question is, how long will you last? Now, then you can adopt the new plan of an associated system, and we would be glad to see it adopted, and see the markets relieved of its enormous loads, while it is of the utmost importance to yourselves.

Mr. Douglass, was followed by Mr. Hibbard, of Boston, and others, endorsing his remarks, but as it was dark in the hall, the reporter was compelled to desist from taking further notes. The Association adjourned for supper, at 6.20 P. M.

Wednesday Evening.

After supper, Prof. Caldwell, was called to the chair, and the Association listened to the paper of Dr. H. A. Mott, Jr., on "The Common Sense of the Salt Question." (See page 52).

Announcement of the death of Harvey Farrington.

Prof. Arnold—I take this opportunity of announcing to this meeting, the death of our fellow laborer, Harvey Farrington, of Norwich, Oxford County, Ont., C. W. Harvey Farrington, as you all know, has long been a member of this Association. He was one of the earliest who aided in forming the Association, and this is the first meeting we have held since his death. This is also the first meeting of the Association, since its organization, that we have missed his pleasant face, from among us. He has never failed, since its organization, of being at the meetings of this Association, and he was always in his place, ready to do his duty. We owe it, therefore, as a matter of respect to him and his relatives, that we make some suitable expression of our regard for his relations to this Association, and I suggest and move, that a committee be appointed to prepare at this time the proper resolutions, expressive of our regard.

The motion was carried, by a unanimous vote.

The Chair announced the following committees:

On Nominations—A. A. Hopkins, Rochester; L. T. Hawley, Syracuse; J. S. VanDuzer, Elmira; T. P. McElrath, New York; W. L. Rutherford, Waddington.

On Dairy Implements—G. F. Bonfoy, E. D. Munson, Wm. Blanding.

On Obituary—B. D. Gilbert, T. P. McElrath, and J. V. H. Scovill.

On Finance—S. S. Hoxie, F. E. Engelhardt, and G. Merry.

Dr. Wight was then called to the chair, when a paper was read on "Organized and Unorganized Ferments," by Prof. Caldwell. (See page 9).

At the close of this paper, the Secretary read the following:

UTICA, Jan., 1879.

For the purpose of aiding in extending to the American Dairymen's Association the courtesy of a Free Hall, in which to hold their Convention, we pay the sum set opposite our names, respectively:

C. A. Linsley, (Butterfield H'se)	$15.00	Field & Pennock,	$1 00
Jones, Faulkner & Co.,	10 00	Howarth & Ballard,	1 00
J. M. Childs & Co.,	5 00	W. Sawens & Co.,	1 00
H. Gilmore,	2 00	Wheaton, Gottry & Johnson,	2 00
Curtiss & Childs,	2 00	Chas. Millar & Son,	5 00
Job Parker's Sons,	2 00	Bagg's Hotel, (T. R. Proctor),	10 00

The Secretary moved that the matter be referred to the Committee on resolutions.

Motion carried unanimously.

Mr. Wilson—Is the making of butter in factories, without using any of the milk for cheese, profitable in this State?

Mr. Wheeler—We have a creamery near us, and it is claimed that they have received more money for their butter alone than any cheese factory has received proportionately, and have still their skim cheese on hand.

Mr. Arnold—In comparison with making butter at the dairies, the creamery system has been a success. In the last census report, at the factories it took nearly 21 pounds to make a pound of butter, showing that it is made with more skill, and will sell for enough more to pay for making the butter. Not that the quality is so much better, but there is so much greater uniformity.

Mr. Douglas—To day in New York city there are thousands of packages of dairy butter unsaleable because of want of uniformity. But creamery butter has this advantage that oleomargarine has—if you want 100, 500, or 1,000 pounds, you can be sure of having it all of the same quality.

Prof. Arnold—In this connection I wish to state some important facts. In 1876, when we held our convention at Rome, a gentleman brought to us a package of butter made in June. It was then January. Upon opening it, it was found to be just as sweet as if it had been made within a week. No one could have told that it was not fresh butter. The secret of this was as

follows: The cream was churned until the butter came. As soon as this occurred, the buttermilk was drawn off, and a strong brine put into the churn. It was then turned a few times to gather into granules or pellets from the size of a pea to that of a hay seed. The process also dissolved the caseous matter and took it away, which would otherwise have impaired the butter. It was then removed and cold water poured upon it, cooling it down to 55°. The butter was then taken and placed in a package in a granulated state and without working. The package was an oaken keg. A strong brine was poured all through the butter, and the head of the package closely fitted in, a hole being left open so that the keg could be filled completely with brine after heading up, and the plug driven in tightly. In this condition butter can be kept any length of time, and through our hottest weather, and come out perfectly fresh. Care must be taken to have the contents thoroughly cooled before opening, then drain off the brine and put the butter in shape for the table or market. This experiment has been tried now for several years by a number of individuals, and it is a well established fact that butter can be kept in this way and sent to any part of the world with certainty that when it arrives it will be as sweet as if just from the churn. This fact is destined soon to make a great revolution in the butter trade. Arrangements are now being made to carry out the system in a large way, in at least one case of which I know.

Mr. Hawley—I have adopted this method, but my views differ a little in relation to transporting it, for I think it should be kept cool. Because butter is better taken from New York to California, when kept from the heat, and in going across the Atlantic it should be kept in as cool a condition as possible. I think it is correct, however, that it must be cooled down inside of the firkin before it is taken out. This method has been before the community for a long while, and still dairymen have not practiced it, only to a limited extent.

Mr. Arnold—I think this would be a grand thing if the dairymen of the United States would adopt it.

Question—How strong should the brine be made, to insure freshness?

Prof. Arnold—Make the brine just as strong as you can make it. It should mark at least 100° by the indicator.

Prof. Engelhardt—The solution of salt should be 26½ pounds of salt to 100 pounds of brine—that is, a saturated brine.

Question—Should the water be as cool as it could be made?

Prof. Arnold—Water is cool enough at 55°.

Adjourned to 9.30 A. M., Thursday.

THURSDAY, JANUARY, 16.

Hon. Harris Lewis called the meeting to order at 10 A. M. After the various inventions had been exhibited, A. A. Hopkins, Esq., took the chair, and the committee on nominations reported. (See second page for list of officers as elected by the unanimous adoption of the committee's report.)

The Association then listened to a paper on "The Purification of Butter," by Col. Lewis T. Hawley. (See page 128).

PRESIDENT ARNOLD.

Prof. Arnold, entering the room, was called to the stage by President *pro tem.* Hopkins, who said: "Prof. Arnold, I have the pleasure of announcing to you your election as President of the American Dairymen's Association, and, gentlemen of the Association, I have the honor of presenting to you your President, Prof. Arnold." [Applause.]

Mr. Arnold then said:

Mr. Chairman and Gentlemen: I thank you most cordially for this mark of your esteem, and I don't know what further I can say in the matter for the compliment, which I feel, and feel deeply. But I must say in connection with it, that I regret that you had not put some one else in my place. For the last year I had made up my mind, and felt as though I would retire from these scenes and rest from the serious labor for me to do perfectly the duties I have discharged in connection with this Association, and I had determined that I would retire permanently and withdraw from the Secretaryship, and leave the duties to devolve on some one else. And with the view of retiring, I have had nothing to do whatever in getting up and caring for this Convention. But I am, it appears, to be disappointed, though I feel, nevertheless, the compliment which you have paid me, and I shall accept—I feel obliged to accept. [Applause.]

The next paper was on "Cheese and Cheese Making," by Prof. Arnold. (See page 134).

At the close of Mr. Arnold's address, he presented samples of cheese from the same from which Nos. 38 and 39 were taken, and a crowd gathered round to examine them. The difference in the two samples was plainly in favor of the no acid sample. Mr. Douglas, of the firm of Douglas & Zin, New York, remarked, "I see one sample is more firm and closer grained than the other, and has more flavor and is better cured, but you did not tell us which is the acid and which is the no acid sample.

Mr. Arnold—I only knew from appearance which is which, but, (pointing to one of the pieces before him), I take the one you say is best to be the no acid. Mr. Gates, who helped make

the cheese and brought it here, will tell you whether I am right.

After looking at the marks on the cheese, Mr Gates said "That is right."

Mr. Douglas--Is this an accident, or can this difference be made all the time.

Mr. Arnold—It is no accident.

A member—Can you make such cheese in hot weather? and if so, please tell us how.

Mr. A.—You can. To begin with, pursue the usual method, till the curd is nearly ready to dip. You may heat the milk to the same degree for setting, use the same amount of rennet, cut the curd the same, and work it and scald to the same degree (98°), and stir while you are scalding and afterwards, just the same as if you were going to make an acid curd. Continue to keep the curd stirred till it becomes quite firm and the whey is well separated, and see that the whole is kept up fully to 98. At some time within twenty minutes or half an hour before the whey would begin to become a little acid, draw the whey (while it is sweet) and let the curd pack in the vat, lifting one end of the vat, so that the whey will drain away readily and not stand around or among the pieces of curd. It is a good way to haul the curd up along each side of the vat, leaving a space in the middle for the whey to run off. As soon as the curd has become packed so solid that it can be handled, cut it into blocks convenient to handle and lay every alternate block upon its next neighbor, to give a better chance for drainage, and arrange the blocks of curd so the whey will not pond up behind any of them. Cover the curd in some way so as to keep it as near 98° as possible, and turn it occasionally to keep all parts warm alike, and let it lie till it will spin on the hot iron an inch or more. The time it may lie in the vat in this situation is not very material. As soon as the curd is out of the whey, it is out of danger, and may lie almost indefinitely. If the weather is hot, and the milk is faulty, so that there is danger of injury, it had better lie till it will string from one to six inches, according to the defective condition of the milk. The more faulty the milk, the more you may let the curd string. There is no particular point at which you *must* stop, or else spoil your cheese. There is no minute work in making the no-acid cheese. The whey can always be safely drawn at any time within half an hour previous to the time at which it would become sour; and after the whey is drawn, it may lie covered and packed in the vat as long as you can find time to wait for it. The only limit is that it should be pressed before it has become so much *cheesed* that it will not adhere well when pressing. The salting must correspond with the indications of the hot iron. The more

the curd strings, the more salt should be used, if it is desired to preserve the cheese. A curd which strings six inches, if salted not more than two and a half pounds to the 1,000, would be ripe enough for use in about ten days at common summer temperature. Three and a half pounds of salt to the 1,000 pounds of milk would not be too much for such a curd, in hot weather. No acid curds always require about 25 per cent. more salt than acid ones. This fact should not be overlooked, as the salting is essential to good keeping. Three points must always be looked after. The first is that the curd should be kept as near blood heat as possible while lying in the vat to ripen; the second, that the whey should run off freely as fast as separated; and the third, that no salt should be applied till it is considered ready to grind. When it has become as ripe as desired, it should be ground fine enough to admit of salting evenly, and cooled to 80°, or a little below, before pressing. Some other items might be added, but what has been said must suffice, as there is not time to say more.

A recess was then taken till 2 P. M.

Afternoon Session.

Hon. Harris Lewis, called the Association to order at the appointed time.

The Committee on Dairy Implements, reported as follows:

Your Committee on Dairy Apparatus, find the following on exhibition, viz: Cooley's Portable Creamery, manufactured by the Vermont Farm Machine Company, Bellows Falls, Vermont; Gang Churn, manufactured by Isbell, Taylor & Co., Little York, Cortland Co., N. Y.; the Perfect Milk Pail, Nesbett Butter Print, also, Wax Wrapping Paper, by the Dairy Supply Co., 15 Murray street, New York; a Can Milk Cooler, by C. G. Riggs, from Lewis county, N. Y.; More's Pyramidal Strainer, by the New England Dairymen's Supply Depot, Poultney, Rutland county, Vermont; also Patent Milk Strainer and Pail combined, Washington Mills, Oneida county, N. Y.; a Tube Cow Milker, by W. H. DeCamp, P. O. Box 1,187, New York, is presented for investigation. Simply the entire exhibition apparently has merits worthy the confidence of those interested in dairy product.

Mr. Real then moved that as Mr. C. S. Page, of New York, had prepared a short paper on "Dairying," it be heard. The indulgence was granted.

The Committee on Resolutions reported as follows:

Resolved, That as an Association, we hereby return our thanks to the citizens of Utica, especially to the proprietors of the Butterfield House and Bagg's Hotel, Messrs. Jones, Faulkner & Co., J. M. Childs & Co., Charles Millar & Son, and others, for their generous subscriptions, by which we are provided with a commodious hall free of cost.

Resolved, That, as our former President, Gov. Seymour, by request, has desired to retire from the chief executive office of this Association, we wish to place on record our appreciation of the valuable services he has rendered during his long period of active service as our President. Gov. Seymour succeeded, as President of the Association, George Williams, the son of Jesse Williams, the founder of the factory system, who was the first President, and served until his death. We wish our retiring President many years of improved health and happiness in his rural home.

HARVEY FARRINGTON.

In view of the death of Mr. Harvey Farrington, of Norwich, Ontario, Canada, who was one of the earliest cheese-makers in Central New York, and one of the original members of the American Dairymen's Association,

Resolved, That in his loss, the dairying community of the United States and Canada has lost one of its most able and intelligent members, one who was a pioneer in the modern scientific methods of cheese-making, and who, during his entire life, endeavored to keep pace with the improvements and advances of the age.

Resolved, That in addition to the qualities named, we recognize, also, Mr. Farrington's character as a man and a citizen. His kindly heart, his straightforward dealing, his quick perceptions of right and wrong, and his strict sense of honor and manliness, were characteristics which endeared him to all who had relations with him.

STATISTICS.

Resolved, That it is of the utmost importance that we have a careful and accurate enumeration of the statistics of the dairy industry of the United States in the ensuing census of 1880. We therefore advise the appointment of a committee of three, to confer with the Government officers having this matter in charge, and respectfully invite the co-operation of all dairy associations in the various States in furtherance of this object.

The reports were duly received and filed.

Mr. Curtis—Only one of the resolutions gives cause for special comment; the others are very appropriate, especially the one of thanks to the gentlemen, whose generous action has provided us a free hall. They are especially deserving. But on the resolution in reference to Harvey Farrington, I think a few words would not be out of place. I recognize Harvey Farrington as a pioneer in cheese making; as a man who has probably instructed more dairymen in the art of dairying, than any other man in the United States, because he was so early in the field, dairying in Herkimer county and in Canada, on the Associated Factory system. He was also a leading member of the Associate System in Canada. As a man, I believe his character was above reproach; and, for myself, I desire here, cheerfully to say that I shall be satisfied if, when I "shuffle off this mortal," I leave as good an impression on the minds of my fellow men as Harvey Farrington has left on mine.

—Prof. Arnold—I most heartily concur in all Mr. Curtis has said in regard to the merits and character of our deceased member Mr. Farrington was a long acquaintance of mine. My first acquaintance with him began in boyhood, when attending district school. I had the pleasure of being one of his pupils, receiving from him a benefit which, I believe, has lasted me all through my life. From his teaching, his earnest manner of impressing ideas, and his clear way of expressing them, he made an impression upon me, as he did upon others, not soon to be forgotten. There was that about him also that made him dear

to us, not only as a teacher, but because of his qualities. He was always genial in all his conduct; he was not, as a great many people are to-day, always fighting an imaginary enemy. He was always in a cheerful, genial mood. While we lived in neighboring towns, we were always accustomed to be together, and to talk together; and many a time have we sat down before the fire and talked from night till morning, so interested did we get discussing subjects, and it seemed that there could be no end to the thoughts and ideas he was always turning out. Thus was he a very near friend of mine, and I remember and cherish him not only as a member of this association, but as personally a dear friend, possessing all those high qualities sacred to men. I never saw the slightest departure from the strictest integrity and highest aim, in his long life. We measure such a man by the magnitude of his soul, and when we measure Harvey Farrington by that standard we put him high up, with his boundlessness and beauty of soul and spirit. He commenced long, long ago in the dairy business, when about twenty-two years of age, and he was about seventy when he died, and he never slacked up one iota in perseverance, in trying to make the best goods himself, while he never showed the least selfishness, but was anxious to impart all he knew to others. We all know how ready he was in all his actions, and how he loved to correct whatever he thought was not right. So I believe the impressions he has made have taken root among the members of this convention. I know they have, and will show themselves for years and years to come. I shall not take up the attention of this convention in dwelling longer at this time on this subject; but at the request of some parties, I expect to write more fully hereafter an account of his life, which will appear in print, and perhaps I shall only be repeating what I shall say then if I dwell longer. But I should like to hear from others that were acquainted with him.

After the unanimous adoption of the resolutions, the Association proceeded to unite with the Ayrshire Breeders' Association, President Birnie being invited to take the chair.

The next paper was on "Ayrshires for the Dairy," by F. D. Curtis. (See page 79.)

Immediately after the reading of this paper, Col. S. M. Wells, of Wethersfield county, read a short paper on "The Ayrshires for the Dairy," by William Crozier, of Northport, L. I. (See page 75.)

Mr. Hoxie—I simply want to ask one or two questions, for my own information. I don't expect to discuss the subject, but I wish to ask them for the purpose of awakening thought. Doesn't the amount of feed that an animal consumes, depend more upon the activity of the animal than upon her size?

Doesn't the milch cow have the ability to produce both milk and beef, or are those two qualities incompatible? Or doesn't it depend upon the way the animal is constructed, and whether she makes her food go to the production of milk, or to the production of fat, put on in the right places, and not in the center of the body?

Mr. F. D. Curtis—I don't think that the Ayrshire breed has all the faults, neither do I hold that she has all the merits.

Mr. Hardin—I think the gentleman makes some statements in his paper which will bear criticism. I say that no farmer in New York State, who has seen the Holstein and the Ayrshire breeds, can believe that the Ayrshire will do nearly twice as much as the Holstein. In the case cited by Mr. Curtis, the Holstein cows may have been remarkably small, and the Ayrshire remarkably large ones. Now, there is a gentleman here from the Oneida Community, where they keep Holstein and Jersey cows, and if he will say that the Ayrshire will do more than the Holstein, I might believe it, but I should not believe it as coming from an experimental farm. Now, supposing that the Ayrshire cow eats nine pounds of hay to every quart of milk. If she can give 20 quarts per day, she must consequently have eaten 180 pounds of hay. Is that likely? The average amount of hay consumed by the ordinary cow is from 20 to 30 pounds; yet, according to this statement, and he quotes from an experimental farm, if the figures were carried out, the cow would eat 180 pounds. I don't think any cow will eat over 100 pounds of hay, at the most. And then he refers to one gentleman whom I happen to know, Mr. Russell, and he states that Mr. Russell says that Holstein cows consume in his herd from three to four times as much as many of the Ayrshire cows. Now, Mr. Waring, in his "Summer Vacation," says that in the best herds of Holstein cattle in Holland, the average is over 4,000 quarts, and in some of these cases it is stated that the Holstein cows give 8,000 quarts—as many quarts as some of the Ayrshires would give in pounds. If we want to get the largest yield I know of, it comes from Holland, and it is 17,000 pounds. I think such statements are liable to mislead the public.

Mr. Hoxie—Let me commence at the last end of the criticism. He says the average yield of cattle in Holland is 4,000 quarts to a cow. Two times four thousand would be eight thousand, and one eighth of four thousand would be five hundred; that would give 8,500 pounds as the average production of the best cows in the best herds in Holland. Let me say that Hengeweld has stated that the average yield in the south of Holland is 3,500 to 4,000 quarts, and that the average yield in Friezeland and the north of Holland is much greater—and he is good

authority. Now so far as the statement in regard to eating is concerned, I took it from the statements published at Eldina. It is not anything of my own. Baron, who took Ayrshire cows averaging 800 pounds in weight, and Holstein cows averaging 1,000 pounds in weight, and carefully experimented with their feeding, found that the lighter cows—the Ayrshires—ate for every 100 pounds of live weight, $33\frac{11}{100}$ pounds of hay in a given length of time; while the Holsteins, that weighed 1,000 pounds, ate $28\frac{10}{100}$ pounds of hay for every 100 pounds of live weight. Then he took of the same breed, four cows—Holsteins—two heavy cows and two lighter ones, and experimented with exactly the same result—for the heavier cows consumed less, in proportion to their live weight, than the lighter ones. So it seemed to me that it was the very sort of experiment that is desired, and went to prove, not that the Ayrshires were greater feeders, according to their weight, but it went to prove that the Holstein weighing 1,000 pounds would consume probably the same proportion as the Ayrshires, weighing 800 pounds. It went to prove that the larger cows consumed less, according to their live weight, than the smaller ones. That was the point which I wished to bring out—not that the Ayrshires, on the ground of their being Ayrshires, consumed more, but that the lighter cows consume more, in proportion to their live weight. I think that is a law which should be borne in mind—that the lighter the animal is, as a rule, the more it will consume in proportion to its live weight, in order to keep it in life and good condition.

The cow eats more in proportion to her activity than in proportion to her live weight. If we keep animals quiet, they will produce more milk. Why? Because, in that state, less goes to the production of nervous energy, and more to the production of milk. Now here is the great point in deciding between the two breeds. The animal that has the greatest amount of nervousness, and is so extremely exciteable, will necessarily consume more than one that is gentle and quiet. Every one must see that these constitute the vital points. This is why we are claiming to-day the superiority of our breed of cattle, and we rest assured by bringing this matter clearly before the people—that they consume less in nervous activity and therefore produce more milk than other breeds.

Mr. J. G. W. French, of North Andover, Mass.—Leaving the matter of nervousness out of the question, I would say that I hoped to hear from the gentleman of the Oneida Community; but I see he has left the hall. In that community they have tried the Ayrshire and Holstein, side by side, and I asked him, this morning, in regard to that point especially, whether the Holstein consumed more than the Ayrshire, or whether the Ayrshire ate more than the Holstein, and he pos-

itivly declared that the Holstein consumed a much larger amount of food than the Ayrshire. He stated exactly about how much—I have forgotten his figures,—but he declared that the amount of food consumed by the Holstein was much larger than that consumed by the Ayrshire, side by side, and under the same circumstances. Now, this is a trial, side by side, under the same roof, and it seems to me that it shows up the result better than any of these discussions which I have heard.

Mr. Hoxie—We must set ourselves on general principles. One experiment does not establish anything. We must start out on a good basis. Now, it is established, by a series of experiments, that an animal that is the most nervous and the most active will consume the largest amount of food in proportion to its weight, or for a given weight. That is a universal principle, demonstrated every day, and among every kind of animals, and in man also. It is just as true in the cow as in others. The animal that is the most quiet, and the least nervous, will consume the least amount of food for a given weight.

Hon. Harris Lewis—I object to "Old Creamer" being classed among the Ayrshires. The best testimony I can get shows she was a grade Shorthorn. [Laughter followed, as both Mr. Lewis and Mr. F. D. Curtis, in their papers, had claimed "Old Creamer."]

The following committee was appointed on Statistics: Messrs. Horatio Seymour, T. D. Curtis, and J. V. H. Scovill.

On motion of Mr. Curtis, the Association adjourned *sine die.*

COMMERCIAL ASPECTS OF THE DAIRY

BY J. M. PETERS, ESQ.

It is most satisfactory to be assigned a topic, the importance of which is so generally appreciated, as is the one upon which I have the honor to address you. It is some five years since I first attended a convention of dairymen as the representative of the commercial interests connected with dairying; and although the subject had frequently been brought before you by many far abler speakers, I am free to confess that the commercial aspects of the dairy, seemed to me to merit much greater interest than they awakened. The plain truths which have been given to the dairymen by the mercantile classes, have not always been flattering either to individuals or even to the dairymen of a particular State or section as a class, but they have been wholesome truths none the less; and it is apparent that however disagreeable some of them have been, they have, for the most part, been heeded. Within the past two years, however, there has been manifested a growing appreciation of the lessons to be learned from the commercial interests, and the events of the past twelve months have been such as were especially calculated to convince the dairymen that, great as is the importance of studying the methods by which his product is to be made marketable, the methods by which it is to be marketed, the requirements of the markets for which it is intended, and the status of competing products in those markets, none the less merit his close and uninterrupted attention.

It should be the glory of every dairyman that the commerce in dairy products is assuming such magnificent proportions in all the markets of the world, and moreover, that it is gaining so important a position among the mercantile interests of this and other countries. While dairying was not slow to gain the recognition of its importance among the varied interests of agriculture, it was long before these products were accorded the position to which they were justly entitled, in our national commerce. This was due to a variety of causes, prominent among which was the fact that almost the entire consumption of our dairy products was domestic. Because of this the traffic in them was so subdivided that the instances where a large capital was employed or heavy transactions were made by individuals, were rare. Judged, as it naturally was, by the extent of ordinary transactions without reference to the aggregate trade,

and it is not to be wondered at that few people ever guessed the vastness of the dairy interests of the country, and the traffic to which they gave rise, or dreamed that they could be made of so much commercial importance as they have now assumed. The entire absence of anything like associated dairying, retarded the growth of these interests and gained for them rather the reputation of fragmentary weakness and insignificance, than of the aggregate strength and prominence which they really deserved long before it was accorded them. If all the flour made in the country were ground in small onerun custom grist mills, great as might be the aggregate, we could not expect the milling interest to attain that universal prominence that it gained years ago, and will doubtless always maintain. No more could we expect any importance to accrue to our woolen industries had we continued to make all our woolen goods on hand-looms in the attics of our farm houses, or even in one-set custom mills.

How, then, could the dairy interest ever attain its full strength or gain the acknowledgment of its real importance, so long as the producers confined themselves to the smallest of herds, acted wholly without reference to their competitors and co-laborers, and never attempted to master the science of dairying, or scarcely dreamed that there was such a science. The agriculturists of the United States have been quick to realize the importance of concerted action, since they were first led to form associations, and the number and magnitude of the societies formed of those who engage in varied or special agricultural pursuits are items which would astonish most of us if they could be given in correct statistics. No branch of agriculture has, I am sure, profited more by organization that the one which this—the pioneer association of its class—represents.

And, along with the development and improvement of the extent and methods of dairying, has come a change in the manner of conducting the trade in these products, which you will find to be mostly salutary. So long as the producers were a disorganized body, with no common aim beyond that of profit from day to day, and no well defined notion of how even that result might best be obtained, they were the easy prey of a class of dealers which, happily, the changes of the past ten years, have well nigh driven out. I refer, first to the small peddling-sort of merchants who lack not only capital, but the ambition or the ability to push their trade into the foremost ranks of our mercantile interests; and secondly, to the unscrupulous dealers by whom the farmer, if he could be found in ignorance of the real condition of the markets, was regarded as legitimate prey, and was swindled with unfailing regularity whenever the chance offered. It is unfair, perhaps, for me to associate with the latter class the small merchants to whom I first alluded and who,

were quite likely to be men of the highest integrity, though lacking the ability to control a large business. But it is plain that the interests of dairymen have been damaged by both these classes of dealers, and without desiring to do any injustice to the honest hucksters who formerly engaged in quite large numbers in the commission trade in all of the principal markets, I am glad for your sake that they have mostly disappeared from the trade, and that your interests are now chiefly in the hands of a class of merchants possessing the financial ability and the broad ideas necessary to bring the butter and cheese trade up to the place of commercial importance which it deserves to occupy.

Since the West came into prominence as a dairying section, its butter-makers have suffered less from unscrupulous merchants than the producers at the East formerly did, and this is because they have managed their business on a different basis. The very small producers have sold their goods to local buyers, by whom they have been re-worked and prepared for market. These men have carried on operations on a large scale, and they, as well as the creameries, have not only sought, but have been sought after by a strong and an able class of merchants. At the East where we have had more farm dairies, and where a larger number of producers have been brought into direct contact with the commission trade, the opportunities for swindlers and hucksters have been greater. It has been a not uncommon fault among Eastern dairymen to pay little attention to the other qualifications of the merchants who sought their consignments, if the promises of prices to be realized were sufficiently liberal. The plausible solicitor, either by his verbal assurances, or by the tempting array of figures in his letters and private circulars, has caught many an unwary dairyman and has been a stumbling block to the whole trade. Then, too, the little dealers, with a small peddling trade, and a few hundred dollars capital, have, through friendship or upon some sort of representation, obtained small consignments; and as the number of such merchants was formerly large, they handled in the aggregate a considerable proportion of the product of farm dairies, and they too proved a hindrance to the growth and elevation of the trade. The manner in which the cheese trade under the factory system has been conducted in this State, has opened the eyes of the dairymen to the importance of changing the methods of doing their butter trade, and has, I believe, done much to encourage a better class of merchants to invest their capital and turn their attention to the traffic in dairy products.

I do not wish to be understood as vouching off-hand for the integrity of every merchant who has a long bank account or who is capable of conducting a large trade. But the standing of a merchant is easily ascertained, and it is, in my judgment,

decidedly to the interest of producers to sustain and affiliate with a class of merchants who have liberal business views and who possess the financial ability, and the intelligence adequate to the building up of a great commercial and agricultural interest.

I alluded a few moments ago to the influence that the natural conditions of a domestic trade had had upon the position of dairy products among the varied agricultural products which enter to any considerable extent into commerce. I do not propose to magnify the importance of an export trade, though we must not lose sight of the necessity that exists for some outlet for our surplus product after our most important patrons—the consumers at home—have been supplied. I do not use the word "surplus" in the sense it is often used, as meaning goods too poor for domestic trade. I only wish every pound of butter made in the United States were good enough for the most discriminating retail channels. But if it were, there would still be more than our home markets could consume, and for the sale of this we must look elsewhere. We have already opened a market abroad for a very large proportion of our cheese products, and our domestic consumption of that article is still but partially developed. Indeed, I may say that our surplus of cheese is rather consumed at home than sent into foreign channels. This, however, will correct itself, and the time will come, I firmly believe, when we shall have a liberal domestic consumption of cheese, and a reputation at home for the excellence of that product which it now fully merits, but does not receive. Then the cheese trade will have assumed magnificent proportions, both at home and abroad. And when that time comes, as come it will in the near future, the extent of our markets for cheese will be such as to employ the product of far more milk than as yet we have ever dreamed of putting into that product.

Meanwhile our buttermakers have a lesson to learn from their co-laborers—the manufacturers of cheese. It is greatly to my regret that I am obliged to still find fault with the methods of the buttermakers of New York State, and to maintain that they have been less progressive than their competitors at the West. An incident related by a friend of mine, familiar with the commerce in dairy products, and who recently addressed a convention in this State upon that topic, will serve to illustrate a feeling among our buttermakers which, I hold, prevails to too great an extent. Like myself, he is young in years, and does not pretend to instruct dairymen in the practicalities of their profession. Just before making his address, he was approached at his hotel by a venerable dairyman, who said to him: "Young man, I understand you have come up here to tell us what kind of butter we ought to make?" "Well, yes, sir," he

replied. "I hope to be able to give you some information which I have gleaned from closely observing the markets." "Why, young man," replied the dairyman, "I made butter before you were born."

Truly he did, and to this day he practices, no doubt, the same method—with perhaps a little more care and cleanliness, which he must have learned at dairymen's conventions—that he employed before my friend was born, more than thirty years ago.

Gentlemen, you must not forget that this is an age of progress. The butter that was wanted even ten years ago is not in so great favor now, and to-morrow, perhaps, the butter that is called for to-day, will be discarded for some other quality. The method of making butter; the best cows for the butter maker; their most profitable feed, and many other points relating solely to the manufacturing processes are points which you must determine for yourselves. But the degree of saltness, the style of package and the time of marketing are matters concerning which you must consult your customer, the consumer, and this you must necessarily do through the commercial interests connected with your product.

The West has been quick to realize this fact, and to-day the West leads the State of New York in butternaking! This is not because the West can make better butter than you. I maintain that the State of New York has, in all respects, no equal in the field of dairying. Your butter *when it is made* has no superior. But the West consults the wants of customers and gives them what they want and when they want it—you do not.

The old practice of putting down dairies of butter should be a thing of the past. Sell your butter when it is fresh, if you will please customers. The West now gives us fresh butter the year round, and the tastes of consumers have been so thoroughly educated to that quality that they no longer look with favor upon any other condition of the product. What chance, then, has your dairy packed butter in competition during the winter with the fresh made goods from the West? When they were made, your dairies were far superior to any of the creamery butter of the West, no doubt. But you held them until, day after day, their sweetness vanished into air, and when the winter comes you market a product unequaled in texture and body, but deficient in that quality which the consumer more highly esteems—the rosy, creamy flavor which is a concomitant of fresh made goods.

As regards the profitableness of having cows come in during the fall, I am not prepared to speak. But the West has largely adopted that method, and it is clear, therefore, that your best time to market butter is during the summer. If you were to generally adopt the creamery system, you would not only lessen

the cost of your product, but you would be able to market it at a time when it was wanted, and in the condition which was most popular with consumers. Intrinsically it might not be so good a product as you now make in the dairies for keeping any length of time. But you should not calculate upon keeping it. Put it up in packages of such size and shape as are acceptable in all markets, and then if it fails to find buyers at home it is suitable to go abroad, and you are certain of a quick sale and of better average values than you can possibly obtain under the present system at the present time. If the tastes of consumers change in the future, meet that change. If they want more salt, give it to them; if less, give them that. You are making butter to sell, and you must make what buyers want and have it ready when they want it.

The most satisfactory package for all purposes is now found to be the Welsh tub. Europeans prefer it, and the prejudice against it has been almost entirely overcome in the home markets, since the West has been using it for its best creamery butter. It is not so good for butter that is to be kept as the oak half firkin, but if butter is to be marketed in a reasonable length of time after making it, the Welsh tub is a good package. These tubs should be uniform in size, and should range from 50 to 60 pounds weight. The "nests" of tubs now used in the "Welsh" districts of this State lack uniformity to such an extent that they are not desirable. The size and style of package have much to do with the successful sale of the contents to exporters, if it be found necessary to seek that outlet. We have a market abroad for an unlimited quantity of butter, and that, too, at profitable prices, if we but meet the requirements of the markets which we seek.

I had hoped to dwell at length upon those two great banes of the dairy—skimmed cheese and oleomargarine. Time forbids, however. As respects skimmed cheese, I may briefly say that it is still the greatest curse of the cheese trade, and that your attention should be promptly given to finding some more profitable use for your skimmed milk than that of cheese making. If you throw it away, it is certainly better employed than in the manufacture of that pestiferous abomination, which I have decried before dairy conventions until I am tired of its name.

Oleomargarine has not been prominent of late, but it is still a competitor of butter, and the strict enforcement of the law relating to its sale is necessary to protect you against it.

In conclusion, gentlemen, let me beg that you will consider that, however unflattering my remarks may be, I am frank solely with a view to benefitting your interests, and that whatever of praise and commendation can be honestly said in favor of the dairy product of the Empire State—and there certainly is much—no one is more zealous in proclaiming than am I.

ENSILAGE.

BY T. D. CURTIS.

We have been much interested in reading a little work of eighty pages, translated from the French, and called "The Ensilage of Maize, and other Green Fodder Crops," by M. Augustie Goffart. The translation is by Mr. J. B. Brown, of 55 Beekman street, New York, who has the work for sale.

"Ensilage" is a French word, and signifies "the act of compressing into pits, trenches, or compartments, called silos; also, the green crops so preserved;" and "silo" "means an excavation, pit or trench, hollowed in the ground, or any compartment used for storing green fodder in an air-tight manner.

The work before us treats of a new method of preserving, in a green and succulent state, all kinds of forage or fodder. This method was discovered or devised by M. Goffart, of Sologne, France, who constructs pits or silos fifteen feet deep, and fifteen feet wide, and such length as is convenient. These must have a perfectly dry foundation and grouted bottom, to exclude all moisture. The pit is sunk about six feet below the level of the ground. The walls are built of brick, about twenty inches at the bottom, and about fifteen at the top. These walls are lined with Portland cement, and made as smooth as possible. Of course, these silos may be made of any other size and shape; but M. Goffart prefers an oval of the dimensions named above, the length thirty or forty feet.

When the fodder corn is in the tassel (clover, lucerne, or other green fodder may be treated in the same way) it is gathered, cut by horse-power into pieces not to exceed half an inch in length, mixed with finely cut dry straw in the proportion of one-fifth in bulk or one-tenth in weight, and the whole as closely packed in the silo as possible by tramping it down as it goes into the silo from the cutter until the silo is full. Particular care must be taken to pack it down next the walls, and the operation of filling must not exceed a period of three days, else the mass will begin to ferment, which must be avoided. Then a layer of three or four inches of cut straw must be spread evenly over the top, plank just fitting in length; the breadth of the silo must be laid close together on the top of the cut fodder, so as to cover it as tightly as possible, and on this must be piled a heavy weight of stones or other material, to press the mass down as the air escapes.

It is essential that the fodder should not be at all dried or wilted, nor contain any but the natural moisture. It is also essential that the proportion of dry cut straw should not be greater than indicated, as it is necessary that the percentage of moisture in the mass should not be reduced below seventy-five; it is about eighty-five in green cornstalks. This moisture excludes the air, which is the most destructive agent. Expel the moisture, and the air takes its place, causing fermentation. The aim is to pack the mass and exclude the air. M. Goffart says: "Each one of my ensilages may be regarded as an immense cylinder, and its covering of plank a gigantic piston; the heavy substances which I superimpose act as a motive power, causing the piston to descend and compress the ensilage, leaving between the planks an outlet for the air, which the compression is intended to drive out."

By this method it is claimed that the fodder retains all its nutritive qualities and other virtues, not only enabling the stockraiser to procure thirty or forty tons of fodder per acre, but to turn out grass-fed products the year round— an immense advantage in winter dairying. M. Goffart says: "My maize, my green rye, my fodder of all kinds, have scarcely changed color after eight or ten months of ensilage. Fed exclusively to my animals, they produce exactly the same effects, the same abundance of milk and butter, the same flavor, and the same color to the butter. These qualities, so important to butter, preserved through the winter by ensilage, are in my eyes the true touchstone, when we seek to appreciate the respective merits of the different processes of preservation of fodder. Let a farmer show me the butter that his ensilage gives him during the winter, and I will have no need of other means of investigation, in order to arrive at his skill." Animals kept on such food require very little water.

M. Goffart claims that all fermentation should be avoided, even such as is obtained by farmers when putting their hay in cocks and allowing it to sweat. Drying is even worse. From the grass that makes such delicious butter before it is dried, you get only pale, tasteless stuff when it is dried and fed to the cow. And it does not nourish the animal, as it does in the green state. It undergoes numerous changes when being converted into hay, even under the most favorable circumstances, and is often badly damaged by rains and dews. "It is sufficient to cross a meadow at the time when the new mown grass is undergoing desiccation in order to recognize that it is losing an enormous quantity of its substance that exhales in the air, in agreeable odors, but which, if they remained in the plant, would serve as a condiment, facilitating digestion and assimilation."

This method of preserving fodder in its green state, has been slightly tried in this country. On the 1st of October, 1876, Mr. Francis Morris, of Oakland Manor, Howard county, Md., put in three small silos of corn fodder, after Mr. Goffart's method. He writes: "The first silo was opened for use on Christmas, and I fed all my milking cows with the same. Two of them refused to eat their portion, and when they left their stalls, the other cows ate it; and from that day I have never fed it to an animal that has refused it. Horses, mules, oxen, cows, sheep and pigs will all leave any other feed and eat this by choice." Mr. Morris adds: "In a very long experience in raising stock, I have found corn fodder, preserved as above stated, the best food for milking cows, that I ever used. It is equal if not superior to June grass, and its cultivation is so easy, its preservation so inexpensive, that to-day no one can estimate its advantage to the agriculturist."

In feeding, the silo is opened at one end and cut down. As the fodder is used, plank after plank is removed. M. Goffart says it is better to loosen the fodder and let it lie fifteen to twenty hours, until alcoholic fermentation slightly begins, before feeding. It then assumes its natural green hue, and the cattle relish it better.

So far as we know, there is no patent on this new method of preserving fodder.

WHAT'S IN A SALT.

CORNING, N. Y., Feb. 1st, 1879.

WE, members of the Farmers' Club, having thoroughly tested the Higgins' Eureka Salt, furnished us by Messrs. Soule & Ridgeway, of this place, cannot speak in too high terms of its merits, and believe it to be the best Salt now offered for preserving Butter—the superiority of its manufacture placing it far in advance of "Ashton," while it possesses all the good qualities claimed for "Ashton."

GEO. P. NIXON, JAMES L. PACKER,
M. W. ROBINS, RUSSELL MATHEWSON,
ANDREW BOWEN, H. D. SMITH.

We sent some Butter to the International Fair salted with Ashton's and Higgins' Salt. That salted with Ashton's Salt sold for four cents less than that salted with Higgins' Salt—made at the same time that the other was made, and was equally as well made.

A. O. KINGSLEY & CO.

STRAWBERRY POINT, Iowa, Jan. 20, 1879.

From Hon. Hiram Smith, President N. W. Dairymen's Association. (Mr. Smith took the $250 Prize at the International Fair.)

You ask my opinion about Higgins' Eureka Salt. In reply I will say that I have used the Higgins Eureka Salt for more than a year in both Butter and Cheese, and am free to say I never used any better Salt. Its use for Butter is preferable to any other I have used, because it is finer grain and is more readily dissolved—can be more evenly distributed through the Butter, requiring less working, thereby better preserving the aroma, and it keeps the butter equally as well as any other Salt.

Respectfully, HIRAM SMITH.

SHEBOYGAN FALLS, Wis., Dec. 24, 1878.

Highly Respected and Energetic Merchants find Ashton's hard to sell.

At the time we took the agency of Higgins' Salt we had in stock five sacks of Ashton's. We placed the two brands side by side, and showed both to our customers, offering both at one and the same price. At the end of one year we had the Ashton Salt still on hand, and were obliged to dispose of it at a sacrifice in order to close it out, while at the same time our sales of Higgins' rapidly increased. We are now selling more Higgins' Eureka than we ever sold of Ashton's, and we never had a call for the latter from a customer that has used Higgins'.

Respectfully, HOYT BROS.

KALTONAH, N. Y., Dec. 18, 1878.

The above are samples of more than one thousand similar certificates from the best dairymen and merchants in all parts of the country.

H. K. & F. B. THURBER & CO.,
Importers, New York.

B. P. & C. E. BAKER, Western Agents.

For Sale by Local Agents throughout the United States.